QR CODES AND THE PUBLIC: TOOLS FOR EDUCATION AT HISTORIC BRUNSWICK TOWN

By

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Public interpretation is an integral aspect of the archaeological process, and modern technology has made it easier than ever to communicate information with the general public. Technological advancements have been an aid to museums, but not all facilities may be able to afford the newest technological advancements. Quick response (QR) codes offer a cost-effective way for every museum to implement new technology into their displays. This paper identifies the visitor use of and response to QR codes aimed at explaining the archaeological process at the Brunswick Town/Fort Anderson Historic Site. It is determined that QR codes are an effective new technology which museums with smaller budgets can invest securely in.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1: INTRODUCTION

As a student of both theatre and anthropology, the importance of public outreach molded my interests of graduate study. The Society for Historical Archaeology's seventh ethical principle states, "Members of the Society for Historical Archaeology shall encourage education about archaeology, strive to engage citizens in the research process and publicly disseminate the major findings of their research, to the extent compatible with resource protection and legal obligations" (Society for Historical Archaeology 2003). The American Anthropological Association's Code of Ethics and the Code of Ethics of the American Association of Physical Anthropologists, "Anthropological researchers should make the results of their research appropriately available to sponsors, students, decision makers, and other non-anthropologists" (American Anthropological Association 2012; American Association of Physical Anthropologists 2003). The Society for American Archaeology's fourth principle reads:

> "Archaeologists should reach out to, and participate in, cooperative efforts with others interested in the archaeological record with the aim of improving the preservation, protection, and interpretation of the record. In particular, archaeologists should undertake to: 1) enlist public support for the stewardship of the archaeological record; 2) explain and promote the use of archaeological methods and techniques in understanding human behavior and culture; and 3) communicate archaeological interpretations of the past…." (Society for American Archaeology 1996).

All of these separate organizations agree that public outreach and education is important to the study of anthropology and archaeology. Public education is so important that it is included in the principles and ethics of the largest anthropological and archaeological organizations in the United States.

During my undergraduate studies, I received degrees in both anthropology and acting. I saw both fields of study as story-telling. Actors tell invented stories which reveal universal truths of humanity, while anthropologists tell the factual stories of humanity which reveal how

humanity is similar and yet still celebrates the differences. These similarities are not immediately recognized, and so during my undergraduate studies I was frequently asked which field I would pursue, acting or archaeology. My answer was always, both. Through some luck, I was able to find an advisor who placed similar emphasis on public outreach and would take a chance on my artistic ideas. Dr. Charles Ewen and I discussed several options for this thesis. I knew that I wanted to use video to educate the public, as museums are often a static medium and I received video production training as part of my acting education. The problems of money and destination arose. Where would these videos be published? How would the production be funded? If they were designed and developed for museum use, how would they be delivered to the public? Some museums use some type of static screen for videos, such as a film room or video screens at specific stations in the museum. I decided my videos would be designed to be included in the exhibits instead of a designated film room. Video screens, such as iPads, are an expensive option, so it was necessary to consider cost-effective alternatives. Dr. Ewen had been impressed by the use of quick response (QR) codes at a Southeastern Archaeological Conference in Georgia, and through research I discovered the creation and implementation of QR codes was only as expensive as sign printing. Together, we decided that my thesis would be designing and implementing videos accessible by QR code which explain the basics of archaeology.

Quick response (QR) codes offer an inexpensive way for museums to deliver information. This new technology is becoming increasingly popular as museums, retail stores, and even airports implement their use. Do visitors use these educational resources, though? This thesis looks to answer that question by creating educational videos which are accessible through QR codes, and surveying museum visitors to better understand their knowledge, use, and enjoyment of the technology. These videos were implemented, and surveys taken at Brunswick

Town/Fort Anderson State Historic Site in Winnabow, North Carolina and the A Time for Science museum in Greenville, North Carolina.

Through the implementation of videos accessed by quick response (QR) codes, this project created a more interactive experience for visitors to learn about archaeology at Brunswick Town/Fort Anderson and collected information on visitor's opinions of QR codes. Specifically, QR coded videos were used to provide information concerning the modern excavations conducted and the methods used. Over the summer of 2018, an archaeological field school from East Carolina University excavated what has been interpreted as the detached kitchen associated with a structure called the Hepburn-Reynold's House. This provided an opportunity to implement QR videos into the site by filming and explaining the archaeological process as it was conducted on site. Being that excavations do not occur year-round at Brunswick Town, these videos would also give visitors the opportunity to see an excavation even during the off-season.

Research shows that the expectations of museum visitors have been changing since the 1990s. Visitors want engaging, informational exhibits, but they also want to get a view at what goes on behind the exhibits (Anderson 2008). This thesis focused primarily on showing and explaining the process of archaeological excavation to the general public through video. Also, the use of QR codes allows these videos to be available online to a much broader audience than simply those who visit Brunswick Town. The videos, which were created from recordings of the 2018 summer excavations, focus on how archaeologists set up sites, how archaeologists interpret sites, why context is the most important factor to the archaeological process, and all of the different information required to interpret a site.

In addition to generating videos, this thesis studied the expectations and reactions of visitors to the use of QR codes in museums. There has been little research done into visitor perception of QR code use in museums, and much of that is outdated and conducted outside of the United States (Haworth 2012; Pérez-Sanagustín et al. 2016; Shin et al. 2012; Shultz 2013, Lo et al. 2013; Ozkaya et al. 2015). Visitor reactions were studied through the implementation of surveys before and after the installation of QR codes. These surveys were used to determine demographics of who visits the museum, their knowledge and previous use of QR codes, and their expected or actual reactions to code use at the museum.

By using a case study conducted at Brunswick Town/Fort Anderson State Historic Site and A Time for Science in Greenville, North Carolina, this thesis looks to determine if visitors to museums and museum-like places will use QR codes implemented into exhibits. Before the results of this case study can be discussed, it is important to have an understanding of the history of museums, how technology has been used and is being used in museums, how QR codes have been studied in the past, and why video is an effective tool for learning. Museums have long been centers for cultural and educational experiences, and so are a natural habitat for archaeological and anthropological works. This concept will be explored in the next chapter.

CHAPTER 2: BACKGROUND

The concept of museums dates back to Ancient Greece and Ancient Rome, where museums were temples dedicated to the Muses who were goddesses of the epic, music, poetry, oration, history, tragedy, comedy, dance, and astronomy (Alexander and Alexander 2008). While museums have changed since 3 BC, especially with technological advancements, the focus of museums has remained on experiencing and appreciating art, history, and science. Museums today are divided based on topic, but we can still enjoy the gifts of the Muses at art, history, and science museums.

Museum Change

Museums of the ancient world, in addition to being a temple to the Muses, were considered places of study. The Alexandrian Museum, for example, possessed collections available for scholars to investigate. In addition to formal museum temples, Ancient Greece and Ancient Rome also displayed some art and religious objects publicly in temples and public gardens. The Middle Ages, or Dark Ages, resulted in a shift away from public displaying of art to private hordes being collected by nobles. This trend was especially popular during the Crusades, as soldiers would bring home exotic art to their lords (Alexander and Alexander 2008). As the Renaissance swept Europe, art and science once again became important parts of public life and people developed an interest in the classic art of the Greeks and Romans. Wealthier individuals would create galleries or “cabinet” buildings in which to display their art, taxidermized animals, and plant specimens. Often, these exhibit halls were private, but would

occasionally be open to the public. In addition to galleries and cabinets, the Renaissance also boasted university gardens for the purpose of botanical study (Alexander and Alexander 2008).

It was not until the late 17th century when public museums began to develop, with the first being the University of Basel Museum in 1671. The 18th century saw the purpose of museums shift from being hoards for the wealthy to occasionally public institutes with the goal of preserving science and art. With that goal in mind, this century saw the opening of Vatican established museums, the British Museum, and the Louvre in France (Alexander and Alexander 2008). Around the same time, museums began to open in the United States as interest groups formed and combined their collections. These interest groups would often begin as members only clubs, but quickly open their collections to the public for a fee. As the United States entered 1900, the goal of museums shifted again. In addition to being places of preservation, museums also became places for education and the spreading of information. This change necessitated hiring individuals for the purpose of interpreting the collections and presenting that information to the public in a way which was meaningful and educational (Alexander and Alexander 2008). These early museums with the intent to educate were not well met with the public, however, as the general public felt out of place in these rich, grand halls full of art. In addition to this, the displays were not organized with any order we would recognize and were more "visible storage" (Alexander and Alexander 2008; 9). As more emphasis was put on encouraging visitation in the 19th century, museums began to organize their collections with the idea of culture history in mind. This manner of organization groups objects from specific times and places so the visitor feels more like they are experiencing cultures as they change through time and or space.

After World War II museums in the United States underwent drastic changes due to new technological advancements, a sudden public interest in the outside world, and increased funding

as a result of increased visitation (Redmon 2015). From the 1950s into the 1960s there was increased emphasis on proper lighting, museum growth, proper collection management, and listening to the concerns and wants of visitors. Lighting in this time period was undergoing major advances. With new lighting technology, museums could choose lights that were not as hot and would cause less damage to the collections. In addition to this, there were also advancements in display glass technology with new glasses being able to disperse light as it entered the case to cause more even and less harsh lighting. This seemingly simple shift in how collections were lit aided in the conservation of art and artifacts and in visitors' viewing enjoyment (Redmon 2015).

Another step towards conservation was proper collections management. Cleverly designed curational facilities in museums such as the Milwaukee Public Museum in 1945 aided in how collections were stored and displayed. The Milwaukee Public Museum implemented using shelving with drawers in order to optimize their storage space (Figure 2.1). Other museums, such as the University of California Berkley Anthropology Museum, the Cahokia Mounds Interpretive Center, and the Gilcrease Museum of Tulsa utilize similar drawer storage as a displaying tool which allow visitors the ability to see more of the museum's collections without displays impairing the flow of the facility (Redmon 2015).

As previously mentioned, after the conclusion of World War II, American citizens had a renewed interest in the outside world as they were newly freed from their isolationist ways. Citizens also had an interest in understanding more about the war, the areas where soldiers had been fighting, and why and how war-time decisions were made. Museums benefited from this increased anthropological interest and received more visitors and therefore had more funds to expand and create the exhibits discussing and interpreting WWII that the public desired (Redmon 2015).

Figure 2.1: Specimen and Catalogue Storage (Milwaukee Public Museum 2017)

Even though there was increased interest in and funding for museums, there was a decrease in the exchange and purchasing of artifacts. Facilities were more likely to acquire new collections through temporary loans. The beginning of the 1960s also saw the rise of Native American Civil Rights. Native American groups all over the country began to demand their sacred artifacts and ancestral remains be removed from display and repatriated to their descendant communities. It was not until 1990, with the passing of the Native American Grave Protection and Repatriation Act, that repatriation of remains, grave goods, and sacred objects were legally required to be returned to descendant communities (NAGPRA 1990). In the 1960s, museums began to be more careful regarding what they displayed, however. If a museum in one area could not display some of their collections due to community outrage, they would loan them to other museums to be displayed (Redmon 2015). The Zuni and Hopi of the American Southwest, for instance, objected to the display of ceremonial kachinas, and so museums in the Southwest would collect, but not display these rare artifacts. Outside of the region, however, there were fewer Zuni and Hopi to recognize what these artifacts were and express their

displeasure in their display. The educational interpretations at museums during this time were more general and broader as opposed to specific and thought provoking. With issues such as how to discuss war and what to do regarding civil rights violations, museums began to debate their place in contributing to society.

As museums became more dependent on State and Federal funding, they found themselves having to prove their worth to their financial backers. This resulted in an increased emphasis on bringing more visitors in and expanding the museum audience. The developing of marketing techniques can be divided into three phases; the Foundational Period, the Professional Period, and the Entrepreneurial Period (Gilmore and Rentschler 2002). The Foundational Period is said to date from 1975 through 1983. During this period, museums coordinators focused on ways to educate visitors, impressing upon museum staff the importance of studying visitors, and how museums impacted the economy of the arts as a whole. As museum directors recognized the power of marketing and advertisement, they transitioned into what has been called the Professional Period.

During the Professional Period, which lasted from around 1988 until 1993, museums were more democratic in how they were run with organizers listening to input from employees and visitors, museum marketing was also seen as a benefit and marketing teams were added to museum employee rosters. This period saw a shifting of power away from the museum, or content to producer, to the visitor, or content consumer. Once marketing teams were introduced into museums, their potential for growing audiences was understood and marketing tactics transitioned into the Entrepreneurial Period. The final period in museum marketing is the Entrepreneurial Period, which began in 1994 and continues to the present. This period is defined by attempting to expand the audience at museums with new content and experiences and an

industry focus on understanding how visitor, museum, and marketing all interconnect (Gilmore and Rentschler 2002).

As museums embraced marketing, some museum directors became concerned for the direction museum education was heading. With the new democratic practices in the way museums are being run, some individuals, such as Hilde S. Hein, have shown concern over lack of control museums directors now seem to have. The goal of modern museums is to allows visitors to have individual experiences and learn in ways which are meaningful to them. Hein argues that with so many different people inputting their ideas on an exhibit, the result is lacking in substance or direction as with a D-Day exhibit discussing the dropping of nuclear bombs (Hein 2000). She also argues that modern touring exhibits actually work towards forcing the visitors to have the same experience and gain the same knowledge. As though museums were factories pumping out visitors after they had information added to them along a conveyor belt. Hein goes on to state that replacing physical objects with technological surrogates of objects will lead to the financial ruin of museums (Hein 2000). Other studies have shown that technology can increase the individuality of visitor experiences, as is the goal with modern museums (Bautista 2013; Gottlieb 2008; Filippini-Fantoni and Bowen 2008; Gammon and Burch 2008; Tallon 2008; and Jewitt 2012).

Museum Technology Evolution

Technology has been used in museums since the 1930s with the first videos being used in 1937 at the San Francisco Museum of Modern Art (Bautista 2013). The first handheld technology was implemented in 1952 at Stedelijk Museum in Amsterdam, Netherlands (Tallon

2008). These handheld devices were called Short-Wave Ambulatory Lectures which used short-wave radio frequencies to transmit recorded information on a loop throughout the gallery. Visitors were provided with portable radios and headphones which could pick up the short-wave frequencies being transmitted to specific locations in the museum in order to correlate lectures to exhibits. The goal of this technology was to create unique experiences for museum visitors, but by the recordings being played on constant loops visitors ended up naturally moving around the exhibit in synch as one lecture ended and the next began. This resulted in a less unique learning experience, much like what was discussed by Hein (Tallon 2008; Hein 2000).

The goals of technology use in museums are to allow for individual experiences and for audiences to feel as though they are part of the creation process as well as learning about a subject. Modern technologies used in museums include handheld devices, stationary kiosks, virtual and augmented reality simulations, websites, phone applications, and social media (Tallon 2008; Gammon and Burch 2008; Filippini-Fantoni and Bowen 2008; His 2008; Bautista 2013; Schettino 2016; Jewitt 2012; and Mamrayeva and Aikambetova 2014). Today, it is considered unthinkable to not use technology for education in museums (Mamrayeva and Aikambetova 2014).

Websites, digital collections, and social media have been a major development for museums in regard to expanding their audiences, increasing access to information, and assisting in research. Museum websites, in conjunction with a social media presence, have been used as a marketing platform to bring in new visitors, encourage repeat visits, and keep individuals updated on museum news (Mamrayeva and Aikambetova 2014; Filippini-Fantoni and Bowen 2008; and Bautista 2013). The Walker Art Center of Minneapolis has a prominent online

presence with their website, The Walker Channel, which broadcasts live lectures online, and their online calendar of events (Bautista 2013).

Filippini-Fantoni and Bowen (2008) have discovered that museum websites are especially useful before and after museum visits. They can be used by visitors to plan trips and get a feel for the museum before they go, and also continue learning about the collections after they leave the museum and conduct research to answer any questions they still have. This concept of learning before, during, and after a museum visit is called the "virtuous circle" and a museum's online presence can help support this circle (Filippini-Fantoni and Bowen 2008).

Digital collections, typically curated on a museum's website or computer system, allow for increased protection of more delicate collections and increased access to collections on a global scale (Mamrayeva and Aikambetova 2014; Bautista 2013). By using digital representations of objects in museum exhibits, this increases accessibility to and interaction with objects which are too delicate to be kept on display (Mamrayeva and Aikambetova 2014; Jewitt 2012). This also allows for seemingly hands-on interaction with collections that visitors would not otherwise be able to experience. An example of this can be seen at the St. Louis Art Museum's Ancient Egypt room where one of their mummies has been digitally scanned and visitors can "peel away" layers of the mummy on a display screen which explains what each view is showing about the body (St. Louis Art Museum 2019). Visitors to museums have also been encouraged to use social media to share their museum experiences, which allows those visitors to edit their videos or pictures and be part of the learning and creating process (Jewitt 2012).

Since the invention of handheld mobile tour devices in 1952, this technology has become almost standard at museums which can afford it (Tallon 2008). Just because this technology is

popular does not mean it achieves all of the desired goals of museum exhibit developers. As previously stated, the goal of using technology in museums is to increase the individual experience and also increase interaction with the exhibit (vom Lehn and Heath 2005). In the past, however, these devices have proved to be limiting in their usefulness. According to a study conducted by vom Lehn and Heath at a contemporary art museum in London, personal digital assistants (PDAs) were used as a handheld interactive tour device and several issues were identified. These PDAs, which were provided by the museum along with headphones, were used by visitors to select audio information about specific exhibits at this art museum in London. It was discovered upon observation that the PDAs and headphones had an isolating effect on visitors, especially ones who were in groups and wished to discuss what they were learning. The devices did not allow visitors to share screens or audio, and so groups who attempted to experience the digital media together were often unsuccessful and irritated (vom Lehn and Heath 2005). In addition to this, visitors would often block access to the exhibit from other visitors unknowingly, as the audio and video made them unaware of their surroundings. It was also noted that visitors appeared to spend more time interacting with the PDA than the physical object in front of them (Lehn and Heath 2005).

Since this study in 2005, efforts have been made to increase the shareability and interactivity of handheld devices. When properly designed, these digital programs have been reported as being accessible and creating an individualized experience, resulting in longer time spent in galleries, promoting more time interacting with the physical object, bringing in new audiences, and being enjoyed by audiences old and young (Gammon and Burch 2008; Filippini-Fantoni and Bowen 2008; and Gottlieb 2008). In addition to PDAs, mobile phones, iPads, CD

players, and laptops, are also commonly used as handheld tour devices in many museums. (His 2008; Bautista 2013; and Filippini-Fantoni and Bowen 2008).

More creative devices include RFID activated stuffed animals at the Nationalmuseum in Stockholm and the Universeum Science Discovery Center in Gothenburg, Sweden. These animals were designed to allow children to interact more personally to the exhibits and be able to choose what character was conducting the audio tour for them. At an old ironworks heritage cite in Avesta, Swede, sensors which were triggered by flashlights being shone on them provided visitors with an interactive audio tour which was also practical in that the ironworks was dark and the flashlights helped light the site (Gottlieb 2008). Perhaps the most obvious handheld mobile device which can be used to retrieve information is a visitor's personal cellphone. As smartphones have become more ubiquitous, museums have begun developing mobile apps which can be downloaded and used as a handheld tour device (Jewitt 2012; Filippini-Fantoni and Bowen 2008; His 2008; and Bautista 2013). The use of one's personal cellphone increases the personalization of the museum experience and has been found to increase interaction with exhibits as with other handheld devices (His 2008).

Stationary kiosks are as common as handheld tour devices, if not more so. These kiosks have been used as stationary computers or touch screen panels in museums to provide visitors with a digital layout of the building or to create an interactive and customizable experience in exhibits (vom Lehn and Heath 2005; Jewitt 2012; and Gammon and Burch 2008). Kiosks allow visitors to select what information they want to learn, and some are large enough to allow for multiple people to use them at one time (vom Lehn and Heath 2005 and Jewitt 2012).

Augmented and virtual reality are relatively new and expensive technology. Two examples of their use come from the Tate Modern Museum in London, England and the

Immigration Museum of Melbourne, Australia. At the Tate Modern Museum, technology was used to create an immersive experience which showed the process of weather creation. Humidifiers and lights were used to simulate the sun and cloud creation and dispersion. Visitors found this augmented reality experience enjoyable in that it was an interactive experience, but not overwhelming (Jewitt 2012). The Immigration Museum utilized virtual reality technology to create a digital program where visitors could interact with a story from Indian mythology. The exhibit was called PLACE-Hampi after the PLACE virtual reality technology and the location which was digitally recreated, Hampi, India. PLACE creates 360-degree interactive digital images and programs. While learning how to work with the exhibit themselves, museum workers also began to develop an understanding of which visitors were more likely to want help learning how to operate the technology. They offered group lessons but found that many people old and young preferred to figure out how to use the exhibit by watching those before them and trial and error (Schettino 2016).

One concern which is repeated with regard to using new technologies in museums is the cost (vom Lehn and Heath 2005; Hein 2000; and Filippini-Fantoni and Bowen 2008). As was discussed above, some technologies are expensive to install and maintain. Yet, despite budgetary concerns, Mamrayeva and Aikambetova argue that technology is important for the success of larger museums which may have larger budgets and smaller museums which may have smaller budgets (2014). Another issue to consider when designing technology for museums is the speed with which technology advances. At the beginning of this century, for example, mobile phones were large devices used only for making calls. Less than two decades later 77% of the United States population walks around with what equates to a pocket-sized computer (Pew Research Center 2018). Gottlieb states that the future of technology in museums lies in combining mobile

devices, stationary kiosks, virtual and augmented reality exhibits, and the internet (2008). With technology being so fast changing and disposable how can museums with small budgets be expected to invest their funding into expensive technology which will be obsolete in a few years? The solution to this is investing in cheaper educational technologies which are just as effective at providing visitors with unique and educational experiences, such as quick response codes. This technology will be the subject of the next chapter.

CHAPTER 3: QR CODES

Quick response (QR) codes were invented originally to be used for the tracking of car parts in the warehouse. These codes are based on the idea of barcodes but designed to be able to transfer more complex data, such as images. In secular use, QR codes require a mobile device which has a camera and an application which can read the code (Shen et al. 2012). Some smartphone cameras automatically contain QR code readers, while other phones require the download of an additional, free application. QR codes can be used as part of advertising ploys, to provide consumers with coupons, to transfer text information, to transfer images, or to link to websites. When utilized in a museum context, quick response codes become another great educational tool in the museum's arsenal.

Past Uses

Since their creation in 1994 by Denso Wave, QR codes have been used for purposes of merchandise tracking, advertising, and the relaying of information. Museums have also started to integrate QR codes into their facilities in an effort to engage visitors more in the act of learning (Shultz 2013). As of 2011, an average of 20 million mobile phone users scanned a QR code over a three-month period with the majority of these scans being conducted at home from magazines to gain coupons. Other common uses include QR codes as digital plane tickets, and scans occurring in grocery stores also for coupons (Ozkaya et al. 2015; Lo et al. 2013). Also in 2011, there was a 9840% increase in QR code use in the United States, this was most likely due to them being newly introduced into the commercial sector and knowledge of their commercial

uses becoming more widely known. Even after this increase, however, only 5% of Americans were reported as using QR codes (Ozkaya et al. 2015). Other reports cite 20.3% of American cell phone users scanning QR codes in 2012, and an increased 26% in 2014 (Shultz 2013; Media Genesis 2018). Not only are users of QR codes increasing, but owners of smartphones are also increasing. As of 2012 45% of United States citizens owned smartphones, while in 2018 77% of United States citizens were reported as owning smartphones (Shultz 2013; Pew Research Center 2018).

The increase in smartphone and QR code usage demonstrates viability in QR code technology. Some research has been conducted into the effectiveness of using QR codes in museums or museum-like settings, but much of that research is dated or was not conducted in the United States (Haworth 2012; Pérez-Sanagustín et al. 2016; Shin et al. 2012; Shultz 2013, Lo et al. 2013; Ozkaya et al. 2015). In addition to being dated, the previous research focused on using QR codes as a virtual tour guide or as an interactive game. None of the previous research studied QR coded videos which provide behind-the-scenes knowledge to visitors. The Brunswick Town State Historic Site park/museum also has limited information concerning recent archaeological excavations which have been conducted at the site or the archaeological process in general.

In 2012, a study conducted in Korea (Shin et al. 2012) investigated which attributes would make people want to use QR codes, and more broadly what factors determine whether a technology will be accepted by consumers. This study, “The Psychology Behind QR Codes: User Experience Perspective”, interviewed consumers who both did and did not use QR codes to determine how and why they used QR codes and what factors would influence their future use. Shin et al. (2012) concluded that the factors which influenced QR code use the most were the ability for interactivity, the perception that the QR codes provided a type of social environment,

and the codes being about seeking entertainment and education in addition to simply information. The researchers recognized the fact that interactivity was the most important factor, but that this has not been well studied. They also recognized that their user sample was not very inclusive, as it only encompassed a small selection of the Korean population. Because of this the global implications of QR use and technology trends are limited. As with most of the other studies, this one used an audience outside of the United States and so the results could be different from an American audience. This study, as with many of the others, took place six years ago, and the technology and its uses, like many computer-based applications, have changed in that time.

In her 2013 research "A Case Study on the Appropriateness of Using Quick Response (QR) Codes in Libraries and Museums", Michelle Kelly Shultz attempted to determine the reactions of visitors using QR codes in a Canadian college library and a museum. In order to test reactions, Shultz interviewed visitors and staff on general reactions to QR codes, expected use trends, what questions visitors had, and expected future use. Her study concluded that there were no negative reactions to the idea of QR codes, but that only one of the 32 observed patrons was seen using a QR code. The results also showed that 59% of visitors interviewed had never used a QR code and only 19% knew what a QR code was before being shown one. However, when prompted with an example QR code, 47% reported they were familiar with the technology but did not know a name for it. Interviews with visitors and staff at the library and museum also identified a common response that "young people" would use the QR codes and that the codes could be used to personalize their visits by selecting what information they do and do not want or need (Shultz 2013: 210-212). This study provides a good model for what types of questions to ask visitors about QR codes and their expectations, and it also supports the idea that visitors are

open to the idea of QR code use in museums. Unfortunately, technology and its uses have changed drastically since 2013, and the statistics of cellphone and smartphone use which Shultz used are now outdated. Since more people have and use smartphones now as compared to six years ago, new research is required to document museum visitors' use and perceived use of QR codes. It is also important to note that this study was conducted in Canada, and cultural differences may impact the opinions of Canadian museum-goers versus American museum-goers.

Pérez-Sanagustín et al. (2016) conducted two experiments, which focused on ways for museum-like places to cost-effectively increase visitor interaction with exhibits. The first test was to determine how visitors to the Royal Botanical Gardens in London engaged with a stationary exhibit screen with text and a video versus a QR code plaque containing text and a link to the same video. Researchers asked visitors to the gardens if they would like to participate in the test, and then proceeded to show them either the screen or the QR code. Visitors were told to interact with the exhibit as they would if the researcher were not there. After the visitors finished their interactions they were asked a series of questions to determine how long they interacted with the exhibit and how they felt about the experience. The results showed that visitors were more likely to spend increased amounts of time engaging with the information that was readily available on the screen as opposed to available through the QR code with 1% of visitors watching the entire QR code linked video and only 2% of visitors watching part of the QR linked video. Furthermore, the presence of a QR code did not affect visitor enjoyment, but rather quality of information did (Pérez-Sanagustín et al. 2016).

The second test conducted by Pérez-Sanagustín et al. (2016) took place at an Engineering School in Chile and examined whether people preferred one-way or two-way QR codes. One-

way codes are used for simple information retrieval, while two-way codes allow users to interact with the information and the information creators in a way which allows them to have a more active role in the learning process. For example, a code which links to a YouTube video could be considered a two-way code, as YouTube videos contain a comments section which allow viewers and creators to communicate.

Researchers observed as people interacted with informational posters containing the different QR codes and timed how much time each person spent with a poster. Researchers also interviewed people on their opinions of the information and content of the posters. The results of this test showed no difference in how much of the text or video a person would read or watch between the two different types of QR codes. For the one-way codes, 30% of visitors watched the entire video and 22% watched part of the video. There was an increase in time spent interacting with the two-way codes with 28% of visitors watching all of the video and 25% watching part of the video. The conclusion formed from both tests was that videos played on stationary screens were more engaging, but 2-way QR codes could be a reasonable, cheap alternative (Pérez-Sanagustín et al. 2016). This research is much more recent than other studies, but neither test was conducted on audiences in the United States. The researchers also admitted to a possible age bias in their garden test, as most of the visitors were older adults. An age bias is also implicated for the college test, as it only included college students. Also, by conducting these two experiments in two completely different parts of the world, England and Chile, the researchers introduced many uncontrollable variables such as differences in culture. Because of these limitations in testing, more research is needed.

Haworth and Peter (2010) attempted to determine the effectiveness of using QR codes to make museum exhibits more accessible to mentally and physically handicapped individuals. This

research was conducted at an English farming and agriculture museum where QR codes were used for visitors to complete various interactive games. Four different trials were conducted in order to determine how best to make the QR codes accessible to visitors with disabilities. Guests were provided with iPads from the museum which could either be worn around the neck or moved in a special mobile box, and researchers observed and interviewed visitors to determine their reactions to the activities. The study concluded that the location of the codes was important for inclusive scanning, so having the QR codes attached to something adjustable was best for all visitors. The research also indicated an enthusiastic response to using the various QR games, but the researchers suggested further study was necessary. As with the other studies, these tests were conducted with an English audience and not a United States audience, therefore the use patterns and preferability could differ between countries. As with other studies, this research was completed in 2012, so research should be conducted on current QR use in museums. In addition, this research focused on the best way to make QR codes accessible to visitors with mental and physical handicaps, not the rate of use or effectiveness of QR technology as a means of information transfer.

In 2013, Lo et al. conducted a study to determine if students at Rockhurst University in Kansas City, Missouri would use QR codes in the university library. This was undertaken in three stages of data collection. The first stage consisted of surveying patrons of the library to determine their opinions of QR codes, their opinions of different ways QR codes were proposed to be used at the library, and to gather more ideas for how QR codes could be implemented to benefit the students. This survey was only accessible by QR code, and so only students who already used codes were surveyed.

The second stage implemented “pilot signs” containing QR codes to determine if library patrons would use the technology. Each sign consisted of three codes and a URL which linked to the same information. The URLs were included to provide an option for students who wanted to access the information but preferred to type in a website into their internet connected device. In total, 40 signs were placed in various locations around the library, and each QR code and URL had a unique digital destination to better track the use of all 120 codes and 120 URLs.

The third stage of this study was a focus group consisting of 16 Freshmen students to determine their opinion of QR codes, collect data on design preferences, and to time how long it took for students to access the QR codes. The online survey showed that 89% of students found the codes easy to use. More codes were scanned from the pilot signs than URLs were used, with 91 codes being scanned and 3 URLs being accessed, which shows a preference to QR code vs. URL. Finally, the results of the focus group were used by the library staff to design future signage. The study concluded that QR codes are considered easy to use by the majority of people who use them, students preferred signage that included instructions and a short URL link, and the codes that did not meet an immediate need were not scanned (Lo et al. 2013). This survey provides important data for understanding use patterns of American college students who already use QR codes, but it does not provide data on people who have not used QR codes in the past but know what they are. This survey is also limited to just college students in the United States.

In their 2015 study, Ozkaya et al. surveyed American college students in order to determine factors which affected QR code use. Only students who had used QR codes in the past were surveyed, and surveys were conducted online. Of the original 174 students, 79 were used for the study as these were the ones who were users of QR codes. This shows that 45.4% of the

original sample size had used a QR code in the past. When asked to identify a QR code, 43% of students interviewed were able to provide the correct answer, with 16% calling it a barcode.

The study conducted by Ozkaya et al. resulted in several conclusions. They found that "practical users", or people who used QR codes for a product related activity such as a grocery coupon, were more frequent users than those who used QR codes for a social or entertaining experience. They also concluded that people who own more electronic devices were more likely to use QR codes, but people who have more knowledge of technology trends were not more likely to use QR codes. Finally, there was low familiarity with QR codes in general in this study, and of the original 174 students interviewed 66% did not own smartphones (Ozkaya et al. 2015). This study was limited by focusing only on people who had used QR codes in the past and did not take into consideration what factors might influence a person who had never scanned a code before into doing so. In addition, this study was also limited by only surveying college students.

Brunswick Town State Historic Site has several informational plaques on the archaeology conducted on site by Stanley South and E. Lawrence Lee, Jr. around the walking path through the site which follows historic roads through the town. The information provided, however, is rather vague and does not include the recent excavations conducted by East Carolina University's archaeology program. There is also a display which provides some information on the archaeological process at the very end of the museum exhibit, but a display and text are not well suited to more than a basic description of how archaeologists excavate. In order to foster public interest in archaeology, it would be helpful to provide the public with access to information regarding the archaeological process. It is important for the public to receive information on archaeology from reputable sources, such as museums, rather than questionable sources such as treasure hunting or pseudoscience television shows, movies, and video games

such as Tomb Raider, Indiana Jones, or Ancient Aliens, as this causes confusion over what archaeological work entails. As long as archaeologists continue to be asked about dinosaurs, there remains a need for accurate information regarding archaeological methods to the general public.

Visitors to museums enjoy feeling like they are being given access to privileged information regarding how museums function (Anderson 2008). Creating videos of an active archaeological dig and explaining the process and methods used in archaeological research will give visitors to Brunswick Town Historic Site a feeling of inclusion in the workings of the site, as well as filling an informational gap in the site's curriculum. The use of QR codes offers a relatively inexpensive means to this end, as well as making it possible to implement videos of excavation directly in front of the area where the recorded excavation took place. This added factor of interactivity reinforces the use of the QR codes and the overall feeling of inclusivity with museum visitors (Shin et al. 2012).

Why Videos?

Moving pictures were created in the 1880s, and since then humanity's relationship with film and videos has changed dramatically. One of the first moving pictures, *The Arrival of a Train at La Ciotat Station*, consisted of a train moving towards the camera in a way that appeared as though the train would emerge from the screen and crush the audience. The effect was so intense that French audiences were reported to have moved out of the way, panicked, and even left the theatre to avoid being crushed (Cousins 2004:23). Audiences quickly realized that this optical illusion could not harm them, and films were an instant hit. Video recording and

editing technology have also undergone many changes and advancements. How sound, color, and special effects are added to film have all undergone technological changes in more than a century of film history. The impact of this technology was not simply ease of editing, but these developments fundamentally changed cinematic styles and who had access to the creative medium of film.

From its invention, film lent itself to the creativity of the artist. Nearly anything a creator wanted to do, they could find a way to accomplish it. Only lack of imagination impeded them. One of the pioneers in film, Guy-Blanche, experimented with sound, visual effects, and hand painting his film roles in order to introduce color into his productions (Cousins 2004). Some film editors would hand paint their film like this but recording color onto film did not become common until 1939 with *The Wizard of Oz* and *Gone with the Wind* (Cousins 2004: 169). Early films often relied on live music to accompany the films and special effects were accomplished through creative editing of film strip frames.

The addition of sound to film was one of the major turning points in the medium. With the addition of sound, the focus of movies shifted from thrilling an audience with visuals to story-telling through dialogue and music. This shift in intent brought hordes of consumers back to the theatres to consume this new escape en masse (Cousins 2004: 116-169). Digital media and computer-generated imagery, CGI, revolutionized the film industry even more than sound. With digital cameras and video editing software available on home computers, nearly anyone could make a decent quality video or movie. As Cousins wrote in his book *The Story of Film*, "…the world of film production was no longer a charmed one into which only the lucky few could enter. The walls around the citadel appeared to crumble…" (2004: 434). CGI also allowed directors and producers to create art never thought possible before. We can have life actors

interacting with digitally created creatures, or we can have Keanu Reeves freeze bullets mid-air. Digital media has allowed the creativity of film producers, editors, and directors to flourish to its full potential. In the early stages of film creators were still equally ambitious and creative, but digital media has made the medium of film more economically accessible and more technologically simple resulting in artistic freedom and innovation (Cousins 2004: 436-448).

Film has developed greatly as an artform and informational medium and will continue to evolve and adapt to and along with technology, human creativity, and culture. Humans have always been interested in movies and videos, and modern technology has only served to increase that interest. Today, a person does not have to be a movie producer in order to create a film or short video. A person does not have to spend a fortune on video, audio, and editing equipment. The average person does not even have to beg a company to produce their work. Modern technology allows a person to spend as little or as much money as they want on equipment, have exceptional experience or no experience, and publish all of their work for free for all of the world to view. Film and digital media technology is not just being used for entertainment purposes, but it is also being used for education and empowerment of disenfranchised groups all over the world.

Anthropology has used video to educate populations and to provide a voice to otherwise overlooked groups. Elizabeth Wicket (2007) worked in Pakistan and Egypt creating educational videos to encourage rural farmers to use new technology to capture rats, give women working at sewing training facilities a voice, and allow women the opportunity to help plan water and sanitation infrastructure. In Egypt, rural women had been shown propaganda style videos in the past in an attempt to get them to use new technology, but these videos always featured women from urban areas who were portraying caricatures of the rural target audience. Because of this

offensive and disingenuous portrayal of rural life, these government-funded videos were not effective in showing rural citizens how their quality of life could be improved with the new technology being advertised.

The primary problem addressed by Wickett in these rural Egyptian towns was getting rats out of homes. Women were using poisons to kill rats, but these poisons would often also result in livestock and family members also getting sick. The goal of Wickett's video was to show the health benefits of live traps. For her video, Wickett did not use urban actors, instead she provided several rural women with live traps and encouraged them to experiment with using those instead of poisons. These women then became able to speak as experts on a product they actually used and address people living in their own town or similar towns. Wickett then filmed these rural experts discussing the benefits of live traps. She found that by using actual women from the rural areas being targeted by the video as first-person experts, the target audience was much more receptive to the message. By giving these women a voice and an opportunity to speak with authority, it also helped to empower these rural women who were often unfairly portrayed in popular media or simply relegated to keeping silent (Wickett 2007). Wickett's other Egyptian film followed rural working women as they went to train other people in sewing. The purpose of this film was to again give a voice to people who were often overlooked or mocked, and Wickett found that instead of the women feeling as though their skills were being taken advantage of, they found that the trainers felt proud that their skills were valued and that they were placed in a position of authority.

Wickett's final video was for women in Pakistan to have a voice in planning water and sewage infrastructure in their towns. Wickett found that the crew responsible for improving water cleanliness and sanitation in the North-West Frontier of Pakistan was entirely male. This

became an issue as the male crew could not socialize with the women who lived and worked in the towns being worked in due to the culture. Since the women spent more time dealing with the water and sanitation issues, as the males typically work outside of their homes and towns, they were more knowledgeable in where facilities were needed and what issues the town was facing. Wickett had to work around culturally limiting factors, as the women in this region followed strict guides regarding where they could go and with whom they could interact. These women could not leave their clan boundaries and could only interact with other women. Because of these factors, Wickett decided to film women naturally doing their work which involved water, such as collecting water, washing hands, and preparing meals, and interview women on issues with plumbing and sanitation. These films also provided a resource for showing where the current plumbing was located inside of residences where the all male crew could not venture.

The primary health issue identified through this video investigation was that the cultural belief that running water was “pure” while water in a tub or basin was bad and “stagnant” resulted in increased water waste in an arid environment as clothing, dishes, and bodies were washed with continually running water. The large pools of stagnant water this practice created resulted in health issues from increased mosquito populations. Location of latrines to water reserves also resulted in contamination of water through ground seepage. These videos of everyday life and women’s work were at first only showed to the women of the towns, in accordance with their cultural restrictions. However, the women went on to give permission to Wickett and her team to show the videos to the engineering team for their use in designing water sanitation and sewage plans. In addition to this, future videos were used to reduce water waste by having older women address their daughters and daughters-in-law and scold them on their

wastefulness, this shaming had the desired effect of the younger women realizing the harm they were causing their homes (Wickett 2007).

Wickett was able to use video as an anthropologist to educate women in rural Egypt and Pakistan. She was also able to empower these women, provide them with an outlet to be heard, and allow their expertise to be used in planning public works projects in their communities. Though there were cultural hurdles, Wickett and her team were able to use video to accomplish these goals in a way that were not previously possible. It was observed that video was successful in communicating with rural peoples who were illiterate and value public speaking skills. Wickett also determined that by using "actors" who were members of the target audience, her videos were better received by that target audience. Video proved to be an effective means of educating rural women in practices that would increase the heath of their homes and providing them with a platform to share their knowledge and expertise in water and sanitation planning (Wickett 2007).

Archaeology has utilized video in the form of documentaries, television shows, and online experiences. In her article, "Seeing the Past: Visual Media in Archaeology", Ruth M. Van Dyke discusses the advantages and pitfalls of using video media for archaeological education (2006). The uses of visual media in archaeology are increasing as the technology becomes less expensive and more accessible. In the United Kingdom and the United States audiences have expressed an interest in archaeology documentaries and television shows, and popular media outlets are providing them with a plethora of choices including *Time Team, Expedition Unknown, Ancient Aliens, Mysteries at the Museum,* and *Diggers* just to name a few shows.

Documentaries are even more numerous, as are docu-series style programs. Not all of these shows provide equally academic interpretations of the past or representations of

archaeology, and here lies the first pitfall of visual media. Video and pictures possess an air of certainty. They are thought to represent the world as it really is, when in actuality all videos and pictures are posed and manipulated in order to tell the story that the photographer or director wants. When archaeologists utilize video, it is important to remember the distorting affect it can have on reality and attempt to be self-aware of any bias being expressed (Van Dyke 2006).

Van Dyke discusses more traditional forms of archaeological documentary and newer, artistic archaeology videos. The documentary as a video genre contains specific styles and expectations which archaeological documentaries follow. Specific types of music, filming techniques, use of images, narration, interviews, and graphics are associated with the archaeology documentary type. A typical example may include "exotic" sounding music to alert the viewer that the location is somewhere out of the ordinary and a voice over narration from an authoritative sounding male. Different shots may include the crew working in the back ground, closeup interviews with experts, montages of maps and images associated with the site and digital recreations of the site being excavated (Van Dyke 2006). These tropes create an experience that the audience can recognize, be familiar with, and be entertained by (Aufderheide 2007). The archaeologist film-maker should be aware, however, that by placing field work in the background, they are devaluing those who conduct the field work and create a false hierarchy of lab over field (Van Dyke 2006). Archaeology documentaries still connect with their audience and introduce the public to sites, cultures, history, and ideas they would otherwise not have exposure to.

More experimental uses of video for archaeology education include "video diaries" through sites and first-person digital reconstructed tours of sites (Van Dyke 2006). "Three Landscapes" is a video diary of two archaeologists giving a tour of Monte Polizzo in Sicily,

Italy. The tour includes descriptions of the site and commentary regarding the archaeological interpretations which are still being debated. This style of tour and commentary allows the viewers to consider all of the archaeological data, form their own conclusions, and feel like they are engaging in the archaeological process themselves (Van Dyke 2006). The second video tour discussed by Van Dyke is "The House of Hermogenes" which is a digital recreation of Priene, Greece from 2 B.C.E. This tour is a more immersive experience for viewers, as it is first-person from the view of the titular character, Hermogenes. The video not only includes descriptive information which would be expected in an archaeological documentary, but also background noise such as conversational chatter, nature sounds, and footsteps. These details create a unique experience for the viewers as they are transported back in time through the eyes of Hermogenes (Van Dyke 2006).

Video, both traditional and experimental, can help archaeologists reflect on their interpretations of the past and also interact with the public. Filming of excavations can increase visitor appreciation and interest after the excavation has been concluded or the site has been destroyed. As video filming, editing, and producing technology becomes more easily usable and accessible by a greater population, the opportunities and applications to archaeology are limitless.

Outside of anthropology, video has proved to be a useful tool for education. In 2017 Wijnker et al. conducted a study to establish guidelines for teachers to select types of videos which are best equipped to meet their teaching aims. This study was conducted in Dutch secondary schools and consisted of interviewing teachers to understand the outcomes desired from showing videos in class and why they chose the videos they did. Researchers also interviewed students to determine the actual outcome of showing the videos in class. The study

concluded that teachers had difficulty explaining why they decided to use videos and what they expected the students to get out of the experience because they had not been self-reflective and analytical during the video selection process (Wijnker et al. 2017). This shows a natural gravitation towards using video for educational purposes, which is unsurprising as Wijnker et al. states videos have been used for this purpose since the 1920s. With educational video being used for nearly 100 years it appears that teachers naturally gravitate towards this medium. One of the teachers even showed a video to his class that he created himself. When pressed for reasoning behind their decisions, however, the majority of teachers wanted to increase the student's understanding of a topic and interest in it. The study determined that the majority of videos selected by teachers were informative in style. Surveys of the students revealed an increase perceived understanding but had little increase in student interest in the topic. One of the flaws with this study was a lack of testing students to determine if they actually learned anything from the videos. This study conducted by Wijnker et al. shows that the use of educational videos has become a common tool that teachers use so frequently that they do not actively reflect on their educational goals or the qualities they are selecting for in their videos. It also reveals that watching educational videos makes students feel more confident in their knowledge of a topic. Whether or not they actually retained the information from the videos was not determined and should be a topic for future research.

Video, particularly internet video, is fantastically popular. As of 2018 over 1 billion hours of video are watched daily on YouTube. The video sharing service had over 1.9 billion users sign in per month with billions of hours of video consumed. Out of this vast amount of traffic, approximately 70% of YouTube views take place on mobile devices (YouTube 2019). These statistics show an intense desire to create, share, and consume online videos. People want to

watch videos, and videos are an effective educating technique. When the narrator is able to speak as an expert and is relatable to the audience, the videos are more engaging (Wickett 2007). Archaeological techniques are also more easily shown than described. The process of establishing a unit, for example, is complex to explain verbally as there are several steps involving measuring and mathematics. Showing a unit being measured out and strung up simplifies a word dense explanation. For all of these reasons, it was decided for this thesis that video was the correct medium with which to educate the public on the archaeological process.

Video has a long history of being used in museums, being used for education, and being utilized in archaeology and anthropology. By combining videos and QR codes it is possible to create a less expensive modern experience for museum visitors. As has been discussed in previous chapters, museum technology tends to be expensive to install and maintain and technological advancements develop so quickly that smaller museums cannot afford to constantly be changing the technology in their displays. QR codes are increasing in popularity, and this thesis will determine if they represent an inexpensive alternative for museums which visitors will actually use through a case study of implementing QR code technology at local museums in eastern North Carolina discussed in the following chapter.

CHAPTER 4: CASE STUDY

The Site

Brunswick, North Carolina was a port city founded in 1725 when Maurice Moore sectioned off 320 acres of his 1500-acre property to accommodate the creation of city lots (South 2010). This town endured several events which culminated in its abandonment including being captured by enemies, enduring hurricanes, citizens moving to Wilmington, being partially burned by the British during the Revolutionary War and subsequently deserted, and eventually becoming the location of the Confederate Fort Anderson, during the Civil War (South 2010). Archaeological and historical research of Historic Brunswick Town began in 1952 by Dr. E. Lawrence Lee Jr. and was continued by Dr. Stanley South and more recently by Dr. Charles Ewen. The research conducted on this historic site by Dr. South was the basis for many of his interpretive methods, such as mean ceramic dating and the North Carolina Artifact Pattern.

Brunswick Town/Fort Anderson State Historic Site was chosen to conduct a case study on visitor use patterns of QR codes. While the current exhibits at the Brunswick Town/Fort Anderson Historic Site briefly discuss the excavations conducted by Lee and South, they have yet to be updated to include the modern excavations. There is also limited information regarding the archaeological process both in the site museum and along the site's paths through the historic town and fort. East Carolina University has conducted summer field schools at the site since 2015, and so the professional relationships formed between ECU's Anthropology Department and the staff at Brunswick Town facilitated the implementation of ideas. During the summer of 2018, East Carolina University's Anthropology Department conducted their annual summer field school at Brunswick Town on Lot 71, also known has the Hepburn-Reynolds property. This

excavation took place from May 14th through June 16th of 2018 and a total of 16 units were excavated. Located on Lot 71 was a rubble pile suspected to be an outbuilding associated with the Hepburn-Reynolds house. The goal of the field school was to determine if the pile of rubble had been a structure, and if so what was the structure's function? A hearth foundation was uncovered and determined to be the hearth of a detached kitchen. Video of excavating was recorded at Lot 71 used to create videos discussing the archaeological process.

Video Production

The process for creating the educational videos can be broken into pre-production, filming, and post-production. During pre-production, themes for each of the four videos were developed. These themes include: setting up a grid, setting up a unit, excavation, and interpretation. The theme of "excavation" eventually evolved into the importance of context. The final video themes and titles were "Setting up a Grid", "Setting up a Unit", "Context and Excavation", and "Interpretation". Once the themes were established, it was possible to write preliminary scripts for the voice overs of each video. Story boards were created based on these scripts, to determine what activities needed to be filmed and how they needed to be filmed to match the creative vision (Figures 3.1-3.3). As previously mentioned, the filming process took place from May 14 to June 16 during ECU's 2018 Brunswick Town excavations of Lot 71. A Canon Vixa HF R800 camcorder, owned by the East Carolina University Anthropology Department, was used to film the excavations according to the shots outlined in the story boards. Post-production involved editing scripts to explain the topics as simply, accurately, and concisely as possible (Aufderheide 2007). The narrative voice overs were then recorded using the same

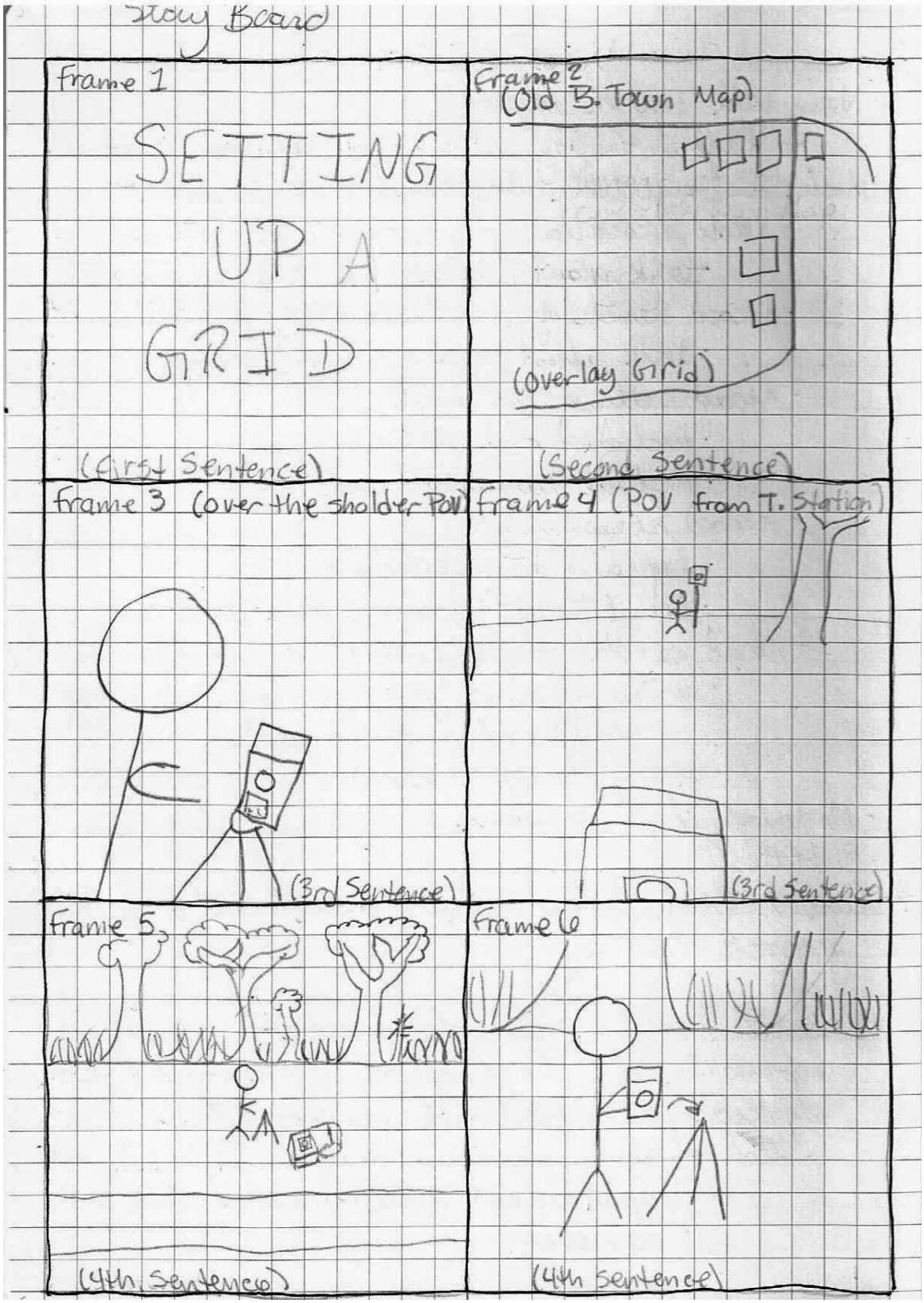

Figure 3.1: Story Board 1

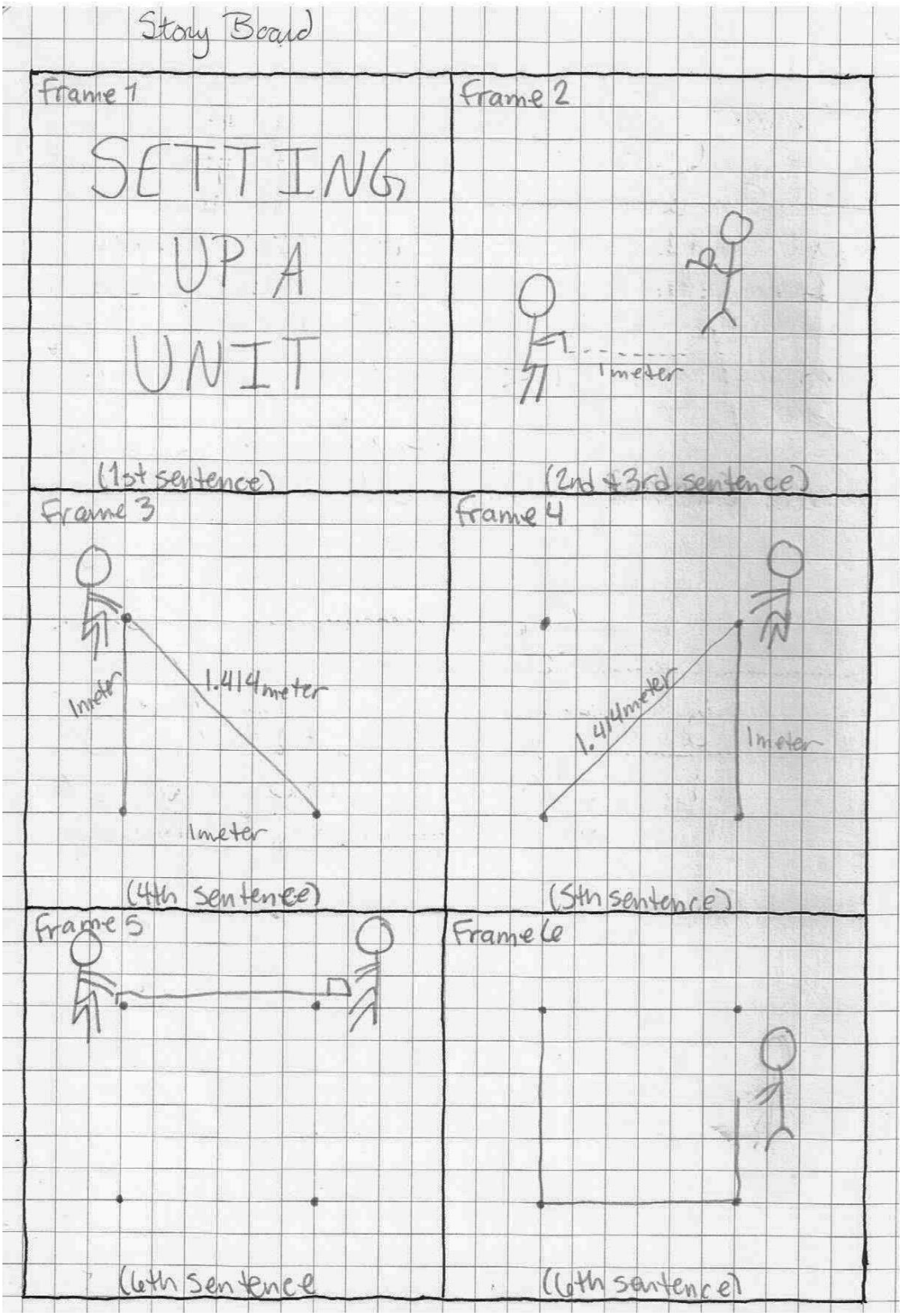

Figure 3.2: Story Board 2

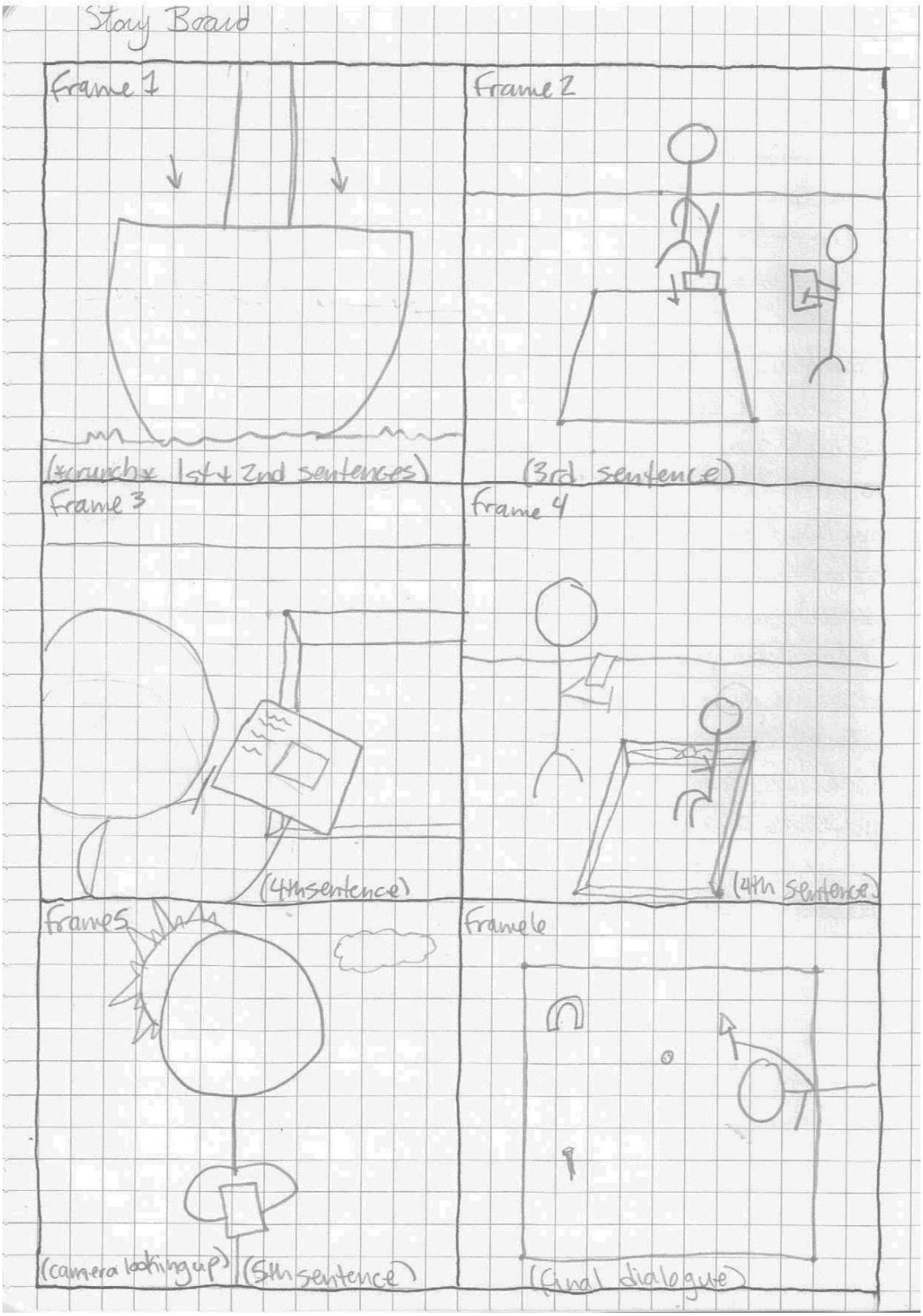

Figure 3.3: Story Board 3

camcorder and an external microphone in the Archaeology lab at East Carolina University. This voice over work was provided by me. Video clips were then edited together along with the voice overs and captions using Adobe Premiere Pro.

Video clips were selected to correlate visually with the activities being described verbally. Verbal topics, and therefore video clips, were kept short to maintain audience interest and create a dynamic video (Aufderheide 2007). Scripts were edited to use non-jargon language to be easily understood by the general public. If any jargon was used, such as "context", it was defined in the video. Captions were included in all videos in order to be inclusive of hearing-impaired visitors (Hawthorn and Williams 2012). In addition to this, text was also added to images of maps and sketches which were used to cite these documents. Sauthier's 1769 map was used to show all of Brunswick Town and Stanley South's conjunctural drawing of Judge Maurice Moore's detached kitchen was used to provide an example of a summer kitchen to compare to the foundation excavated. Shapes were added to two videos to provide a visual example of the topic being discussed. In the "Setting up a Grid" video, the process is described as "placing a sheet of graph paper over the entire site". To show this visually, the 1769 Sauthier map of Brunswick is shown and a grid was created and made to fade into place over the map. In the video "Setting up a Unit", the process of triangulation is described as "using the Pythagorean Theorem", and so a graphic of the Pythagorean Theorem was added over the video clip. This graphic was a right triangle which followed the lines of the unit being strung up. The sides of this triangle were labeled "A", "B", and "C" and to the side of the unit the formula $A^2 + B^2 = C^2$ was included.

The voice acting used for the narration involved developing the proper tone and performing a script analysis to ensure emotional and tonal variance to make the voice acting

more dynamic. A deeper speaking voice was used as studies show narrators with deeper voices, often men, instill the audience with a sense of knowledge and authority (Aufderheide 2007). As I am a female with a naturally high-pitched voice, practice was required to develop the proper authoritative pitch while still maintaining an inviting and non-aggressive tone. A Standard American dialect was also used to simulate the dialect used in news reports and to minimize any confusion caused by regional American dialects. The script analysis involved assigning action or emotional words to each sentence which would trigger vocal changes in the voice acting.

After taking into consideration all of the stylistic choices, the videos were edited together using Adobe Premiere Pro. The creative editing decisions made were done so in order to create a product that was informative, visually and audibly appealing, and made the concepts easy to understand. When the editing process was complete, the videos were uploaded online, and the web links used to create QR codes to be placed in signage for museum use.

QR Placement

As previously stated, once the videos were completed they were posted on a YouTube channel called Archaeo Adventures at https://www.youtube.com/channel/UC6oniSk44Jr4rOXZTLrDZmg, which was specifically created by the author to educate the public on archaeology. The web links for these videos were then turned into QR codes using a free QR code generator at https://www.qr-code-generator.com/. These codes were then designed into a display board which explains the process of using a QR code and informs visitors how to access the videos online if they are unable to use the codes (Figure 3.4). The design for this display board was kept simple to lower production

costs and was created using Adobe Illustrator. Sizing for the informational board was designed to fit a standard 8.5 x 11" sheet of paper to allow for ease of printing. A brief description of what the videos were about along with a step-by-step guide on how to use the QR codes was included on the top of the page above the codes. Below the codes, visitors were directed to the Archaeo Adventures YouTube page if they were unable to access the videos on their mobile devices in an effort to be more inclusive of visitors who may not have access to a QR code reading device.

The completed informational board was printed and displayed at the A Time for Science museum in Greenville, North Carolina inside of a plastic sign holder. Due to damage caused by Hurricane Florence, Brunswick Town was inaccessible by the time the videos were completed. At this same time, the A Time for Science museum was in the process of developing an exhibit on colonial archaeology and allowed the videos to be displayed and their visitors surveyed. As the interpretive video makes less sense outside of the context of Brunswick Town, the remaining three videos discussing the excavation process were used at A Time for Science.

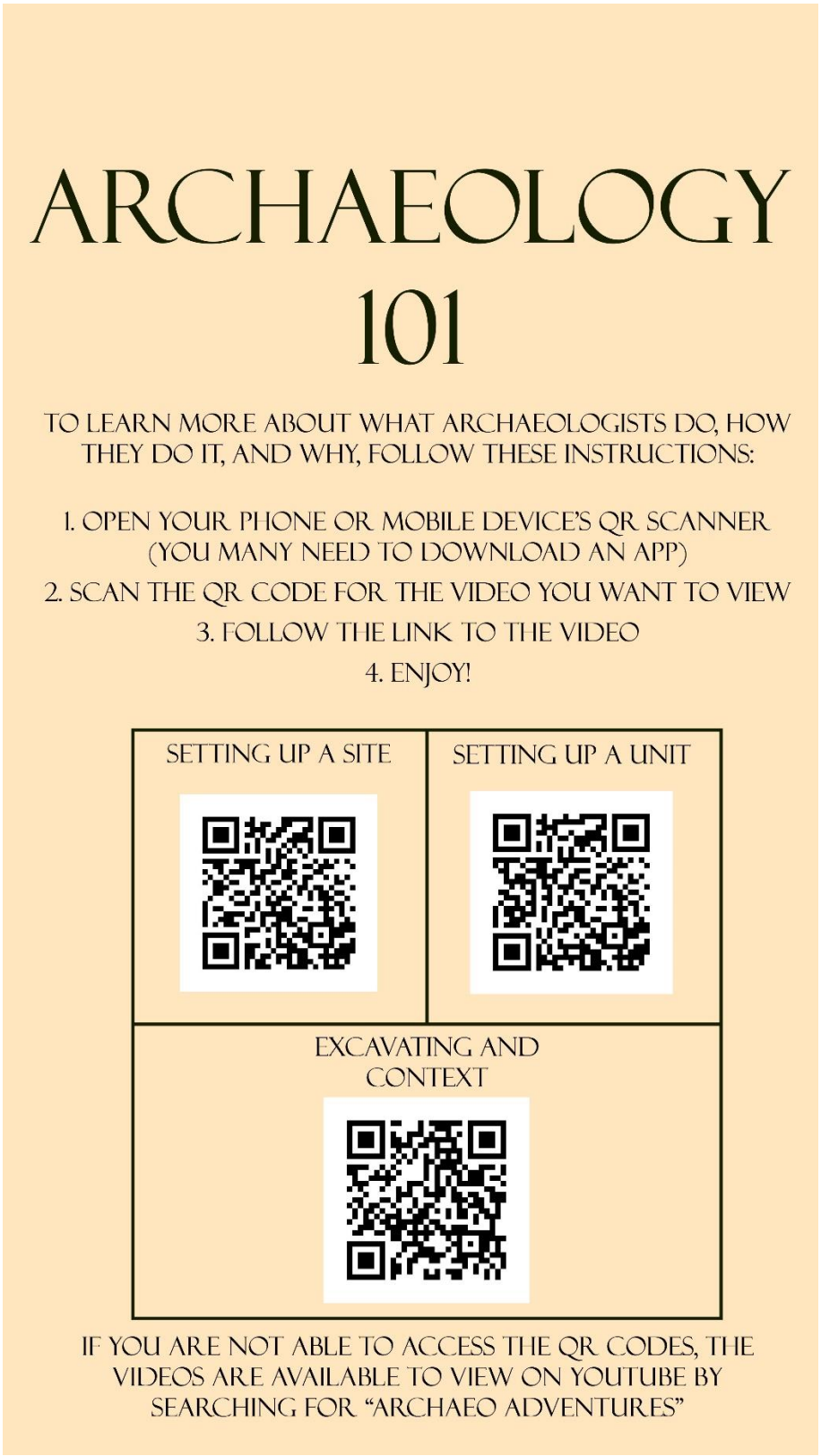

Figure 3.4: Display Board

Surveys

Visitors to Brunswick Town/Fort Anderson State Historic Site and A Time for Science Museum in Greenville, North Carolina were interviewed regarding their familiarity and use of QR codes. The surveys conducted at Brunswick Town occurred prior to the creation and installation of the QR code accessible videos to determine demographics of the visitors who attended the site and whether there was an interest in the technology. A Time for Science was chosen as the location for the second survey due to Brunswick Town being incapacitated after Hurricane Florence. This second survey was conducted after the creation and installation of the QR code accessible videos to determine demographics of visitors to a different site for comparison and to test actual visitor use of the technology.

Pre-Installation

Over the summer 2018 excavations at the Brunswick Town State Historic Site, visitors were surveyed to determine basic demographic information, frequency of museum visits, their expectations of the proposed QR codes, and former knowledge of and interaction with QR codes. A total of 104 surveys were completed over a period of 5 days during May and June. Visitors filled out surveys asking their age on a range, how often they visited museums, their knowledge of QR codes, and if they would use a QR code in a museum setting (Appendix A). These surveys were administered by me. People younger than 18 were not surveyed in accordance with the IRB guidelines which classify minors as a protected group. Because minors are a protected group, the process for IRB approval would have been more involved, and so for the sake of time and

simplicity it was decided to exclude minors from the study. Also in accordance with IRB guidelines, all visitors surveyed were informed of the purpose of the survey, that no private information would be collected, and that they could opt out of any part of the survey (Appendix C). The majority of surveys were conducted on May 26, while Brunswick Town had an event to celebrate the 250th anniversary of St. Phillips Church being constructed. This event caused a larger number of people to visit the site in one day, and greatly boosted my sample size. A table was set up near the excavation to inform the visitors on the field school research, display a selection of the more interesting artifacts, and conduct surveys with the goal of surveying 100 visitors. The remaining 4 days of surveying took place on days without special events resulting in a total of 104 surveys.

Age, group size, and frequency of museum visits were asked to better understand who was visiting the site and to provide the opportunity to determine any trends in QR use based on age or frequency of museum visits. Survey questions were written based on surveys conducted by Shin et al. 2012, Shultz 2013, and Pérez-Sanagustín et al. 2016. The questions asked were as follows.

1. What is your age range?

   18-30
   31-40
   41-50
   51-60
   61-70
   71+

2. How many people are in your group?

   Adults (18 and Older) _____ Children (Under 18) _____

3. How often do you visit museums (history museums, art museums, zoos, historic sites)?

   Several times in a year.

1-2 times every few years.
Rarely, if ever.

4. Are you familiar with what a Quick Response (QR) code is? (One of these )

   Yes
   No

5. Have you ever used a Quick Response (QR) code?

   Yes
   No

6. Would you be open to using a Quick Response (QR) code to access additional information at a museum exhibit?

   Yes
   No
   Unknown

After the surveys were conducted, the data were placed into an excel spread sheet to be statistically analyzed. Percentages for each answer were calculated. Then, response rates were determined for every age range and museum frequency. The data collected from the pre-installation survey were then compared to the post-installation survey during analysis.

Post-Installation

The second survey took place at the A Time for Science Museum after the QR codes were installed in October. Visitors completed surveys asking their age range, how often they visit museums, their knowledge of QR codes, if they used the QR codes, if they did not would they use the QR codes in the future, and was the process easily understood. Survey questions were based on studies conducted by Shen et al. (2010), Shultz (2013), Pérez-Sanagustín et al. (2016), and the pre-installation survey. The second survey questions were as follows.

1. What is your age range?

   18-30
   31-40
   41-50
   51-60
   61-70
   70+

2. How many people are in your group?

   Adults (18 and Older) _____ Children (Under 18) _____

3. How often do you visit museums (history museums, art museums, zoos, historic sites)?

   Several times in a year.
   1-2 times every few years.
   Rarely, if ever.

4. Are you familiar with what a Quick Response (QR) code is? (One of these )

   Yes
   No

5. Did you use any of the Quick Response (QR) codes available in the museum?

   Yes
   No

6. If you did not use any of the Quick Response (QR) codes, would you be open to using a QR code at a museum in the future?

   Yes
   No
   Unknown

7. Was the format understandable and easy to access?

   Yes
   No

The museum staff and I administered these surveys at A Time for Science between October 5 and November 19 of 2018. As with the first survey, visitors younger than 18 were not surveyed in compliance with IRB guidelines, and all visitors surveyed were informed of the purpose of the survey, that no private information would be collected, and that they could opt out of any part of the survey (Appendix C). Age range and rate of museum visit were included in the second survey to also analyze any correlation between these factors and use of QR codes and compare demographics to the first survey. After the surveys were conducted, the data were placed into an excel spread sheet to be statistically analyzed. Percentages for each answer were calculated. Then, rates of every answer were determined for every age range and museum frequency. As previously stated, the results from the two surveys were compared during analysis, which will be discussed next.

CHAPTER 5: RESULTS

Videos

The video editing process presented many challenges and learning experiences. My past experiences with video production and graphic design were limited to my undergraduate studies, and so there was a steep re-learning curve as I became familiar with the programs again. Thankfully, there are tutorials available online for skills and program functions I had forgotten out of disuse. In the end, the videos and graphics produced were acceptable, but there are several areas which could be improved in future endeavors centered primarily around video and sound recording.

When editing began, it became clear that while I had followed my story boards and captured the shots planned, it would have been beneficial to film more of the excavation. This resulted in some footage of artifact analysis and general views of the site being recorded after the excavations concluded. In the future, more unplanned shots should be recorded to allow for greater creative editing. Many of the recordings were also shaky, due to issues with the camera tripod. The tripod used was too short, resulting in many shots being filmed without the benefit of a tripod. With a larger, heavier camera this would have posed a smaller issue, but the light university camcorder was sensitive to every small shift. This can be avoided in the future by using a taller, more stable tripod.

Audio recording was the second problem area identified during video production. An external microphone was used in order to improve audio quality, but the area in which the audio was recorded was not well suited to the task. The room used was large enough to allow for echo

and audio distortion, no sound deadening materials were used in the room, and the room contains electronics with added unwanted ambient sound. These sound issues were not realized until after publication. The audio in the films is still understandable, and it was deemed acceptable for an outside exhibit where there will be natural ambient noise to distract from the slight electronic sounds in the recording. Future audio recordings can be improved by using a higher quality microphone and taking place in a different room. A room better suited for audio recording would be the size of a closet, contain blankets or some other type of sound deadening material such as foam, and would not have electronics or air conditioning to produce ambient sound.

Overall, the final video products contained accurate, educational information on archaeology and the audio, video, and graphics came together in an acceptable manner. By sketching out what I wanted the videos to look like before I went into the field aided in planning and capturing the shots necessary. Some mistakes were made, as can be expected, but these mistakes were learning experiences that did not drastically harm the final product. With the videos completed there remained the question of whether visitors to would actually view them, however.

Surveys

The primary question addressed with this research was, “will visitors to museums actually use quick response code”. Does the general public know what QR codes are, do they use QR codes outside of museums, and how do age and rate of museum visit affect visitors’ knowledge and use of QR codes? Few studies have been conducted into how likely museum goers are to use quick response codes. Of the few studies reported, none study the use of QR linked videos as

supplementary information (Shin et al. 2012; Shultz 2013; Pérez-Sanagustín et al. 2016; Haworth and Peter 2012; Lo et al. 2013; and Ozkaya et al. 2015). The past studies either examine QR text or images or the information presented via QR code is also presented to the visitor on a physical plaque. This study was conducted in two parts, surveying museum/park guests before the implementation of QR codes and after implementation. The survey conducted prior to implementing the QR codes was of visitors to Brunswick Town/Fort Anderson State Historic Site in order to determine demographics and knowledge of quick response codes. The second survey, conducted after the implementation of the codes, was of visitors to the A Time for Science museum in Greenville, NC due to Brunswick Town suffering damages from Hurricane Florence.

Pre-Installation Survey

A total of 104 visitors were surveyed at Brunswick Town prior to the QR codes being installed at the site. The ages of these visitors were reported as being 17.3% in the 18-30 age range, 12.5% 31-40, 17.3% 41-50, 25% 51-60, 19.2% 61-70, and 8.7% were 71 or older (Figure 5.1). The age group which constitutes the greatest frequency of visitors was 51-60, which is comparable to the national average of people aged 45-54 comprising the largest age group (Farrell and Medvedeva 2010: 12). When asked about the frequency of museum visits, the surveys revealed that 73.1% visited museums several times a year, 22.1% reported as visiting 1-2 times every few years, 1.9% visited rarely, if ever, 1.9% of those interviewed were museum workers, and 1% were left unanswered (Figure 5.2). An overwhelming majority of visitors to Brunswick Town/Fort Anderson are frequent museum-goers. This data begins to reveal an image

of the average visitor to Brunswick Town. The average visitor is an adult, aged 51-60, who visits museums several times in a year.

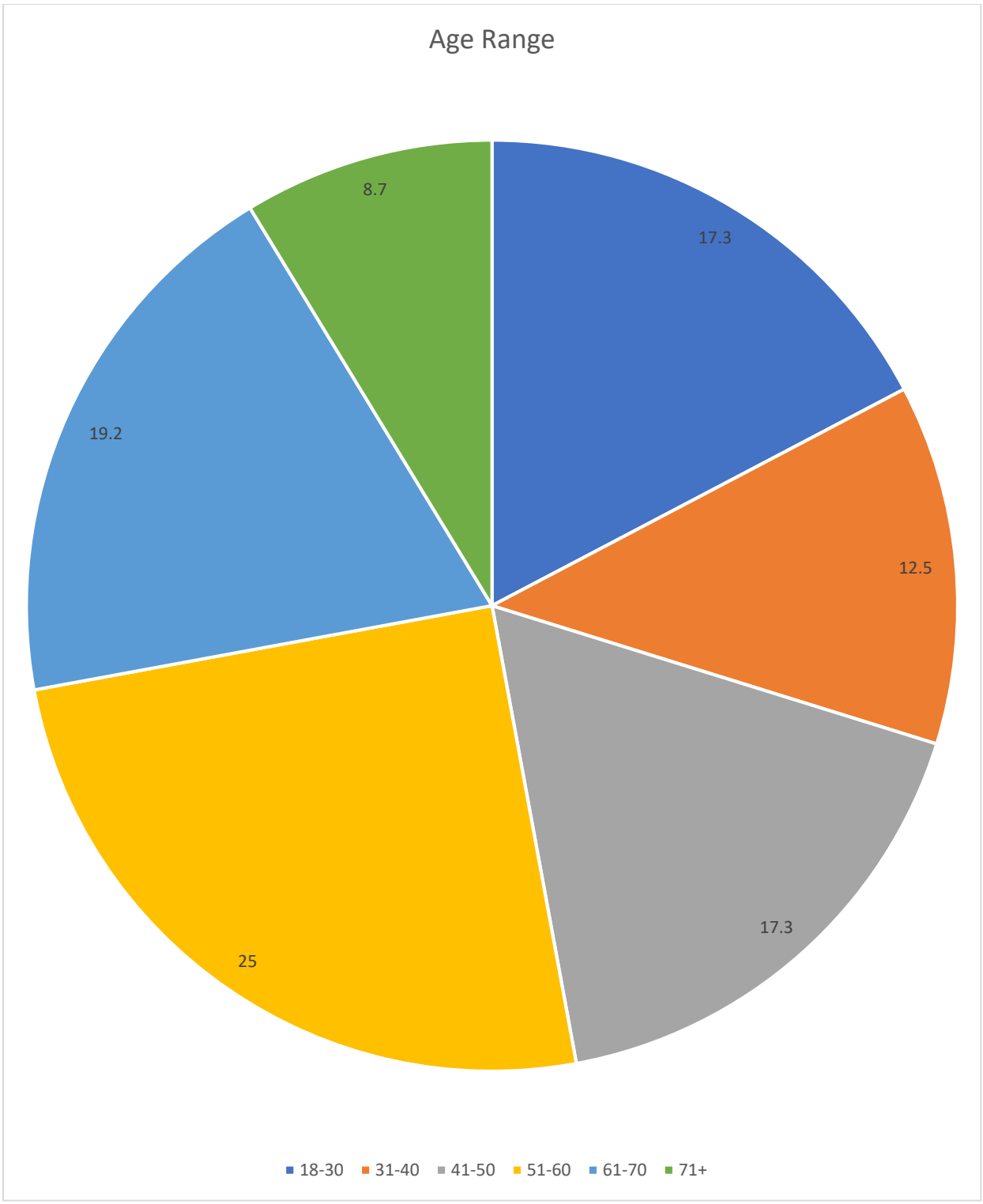

Figure 5.1: Age Range: Percentage of Total Surveys

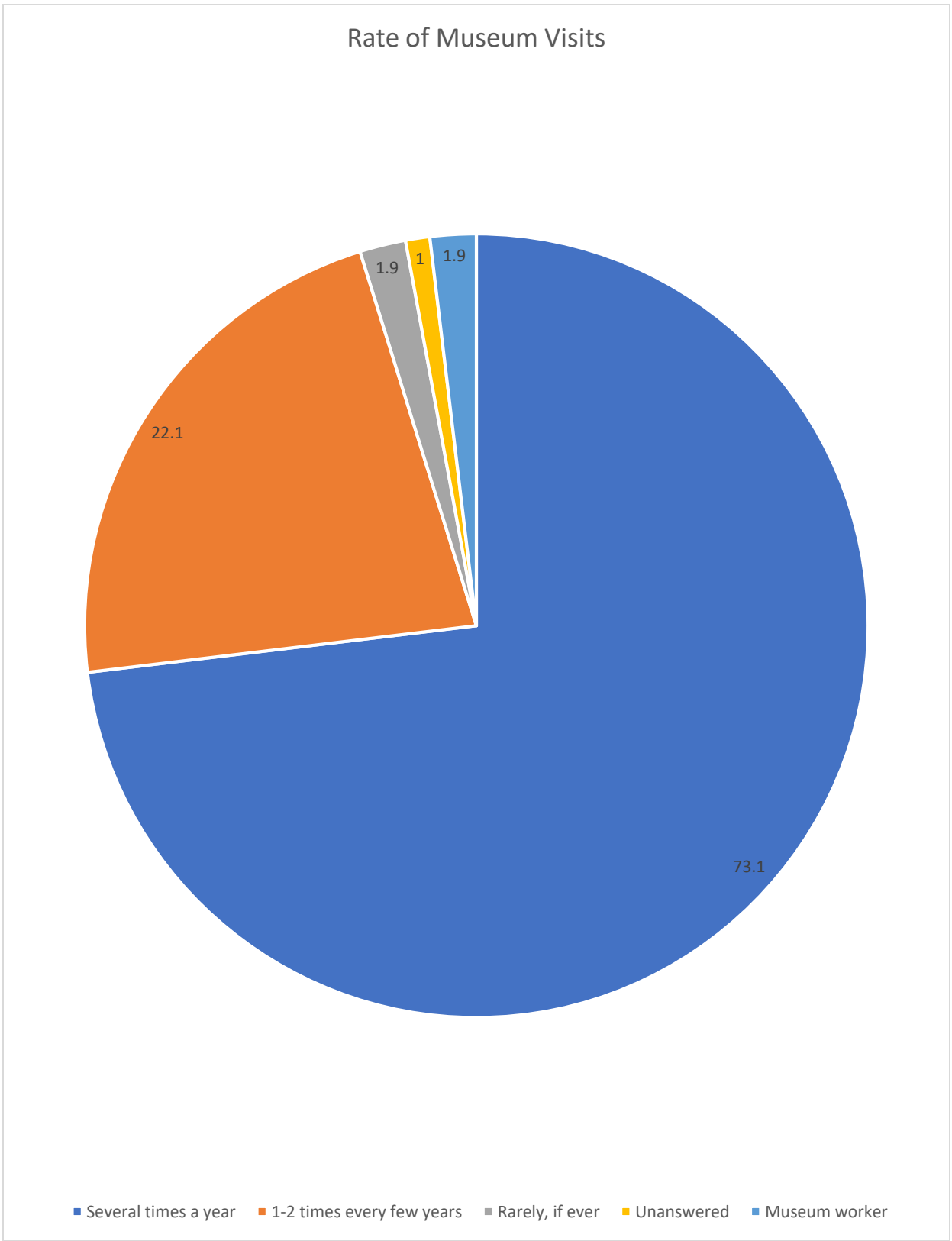

Figure 5.2: Rate of Museum Visits: Percentage of Total Surveys

When asked about familiarity with QR codes, 76.9% of visitors reported they were familiar and 23.1% reported unfamiliarity. However, only 54.8% of visitors had used a QR code in the past with 45.2% having never used one. When asked whether they would use a QR code in a museum setting, 82.7% responded yes, 4.8% responded no, 11.5% did not know, and 1% said maybe (Table 5.1).

Familiar with QR Codes	**Percentage of Total**
Yes	76.9
No	23.1
Used a QR Code	**Percentage of Total**
Yes	54.8
No	45.2
Would Use QR Code at Museum	**Percentage of Total**
Yes	82.7
No	4.8
Unknown	11.5
Maybe	1

Table 5.1: Results to Questions 3-5 First Survey

Two questions to be analyzed were how age and rate of museum visit affected knowledge of QR codes, and rate of use, if these demographical factors had any impact at all. The results showed that, to an extent, age range affected the knowledge and use of QR codes with a massive drop in familiarity and use in visitors over the age of 70, while rate of museum visit appeared to have less of an affect on knowledge and use of QR codes (Table 5.2). The following data are represented in percentages for each age range or rate of museum visits.

Age Range	Familiar with QR		Used QR		Would Use QR in Museum			
18-30	Yes: 88.9	No: 11.1	Yes: 72.2	No: 27.8	Yes: 94.4	No: 0	Unknown: 5.6	Maybe: 0
31-40	Yes: 92.3	No: 7.7	Yes: 76.9	No: 23.1	Yes: 92.3	No: 0	Unknown: 7.7	Maybe: 0
41-50	Yes: 88.9	No: 11.1	Yes: 61.1	No: 38.9	Yes: 72.2	No: 0	Unknown: 22.2	Maybe: 5.6
51-60	Yes: 76.9	No: 23.1	Yes: 53.8	No: 46.2	Yes: 84.6	No: 3.8	Unknown: 11.5	Maybe: 0
61-70	Yes: 60	No: 40	Yes: 45	No: 55	Yes: 85	No: 5	Unknown: 10	Maybe: 0
71+	Yes: 44.4	No: 55.6	Yes: 0	No: 100	Yes: 55.6	No: 33.3	Unknown: 11.1	Maybe: 0
Rate of Museum Visits	**Familiar with QR**		**Used QR**		**Would Use QR in Museum**			
Several times a year	Yes: 77.6	No: 22.4	Yes: 57.9	No: 42.1	Yes: 88.2	No: 2.6	Unknown: 7.9	Maybe: 1.3
1-2 times every few years	Yes: 69.6	No: 30.4	Yes: 43.5	No: 56.5	Yes: 60.9	No: 13.0	Unknown: 26.1	Maybe: 0
Rarely, if ever	Yes: 100	No: 0	Yes: 100	No: 0	Yes: 100	No: 0	Unknown: 0	Maybe: 0
Unanswered	Yes: 100	No: 0	Yes:0	No: 100	Yes: 100	No: 0	Unknown: 0	Maybe: 0
Museum worker	Yes: 100	No: 0	Yes: 50	No: 50	Yes: 100	No: 0	Unknown: 0	Maybe: 0

Table 5.2: Effect of Age Range and Rate of Museum Visits on QR Use and Knowledge

Post-Installation Survey

A total of 28 surveys were completed at A Time for Science following the installation of QR codes. The demographics of these visitors were self-reported as being 28.6% in the 18-30 age range, 14.3% in the 31-40 range, 10.7% 41-50, 21.4% 51-60, 16% 61-70, and 10.7% were reported as being over 70 (Figure 5.3). The age range with the greatest frequency of visits was 18-30. When ask about estimated frequency of museum visits 72% responded as visiting museums several times a year, 28.6% said 1-2 times every few years, and 7.1% replied as

visiting museums rarely, if ever (Figure 5.4). Similar to Brunswick Town, the vast majority of visitors to the A Time for Science museum reported themselves as being frequent museum goer. Unlike Brunswick Town, however, the most frequent age range to visit A Time for Science was 18-30, with 51-60 being the second largest age group. This difference could be accounted for by the location of A Time for Science in the Uptown region of Greenville, North Carolina. This is an area which is currently undergoing development to create businesses aimed at attracting the patronage of the local university students. Keeping these factors in mind, it appears as though the average visitor to A Time for Science is 18-30 and frequents museums several times a year.

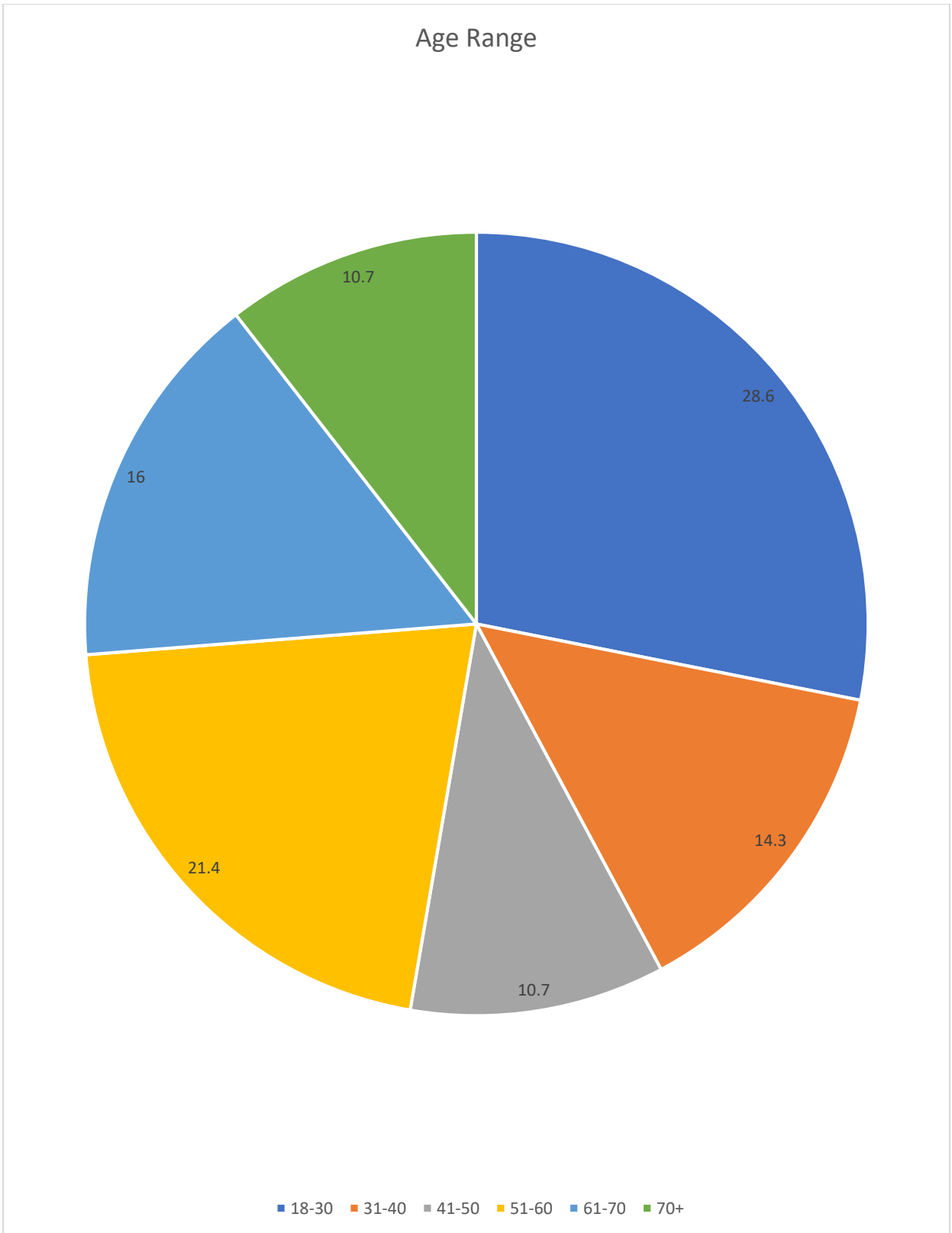

Figure 5.3: Age Range: Percentage of Total Surveys

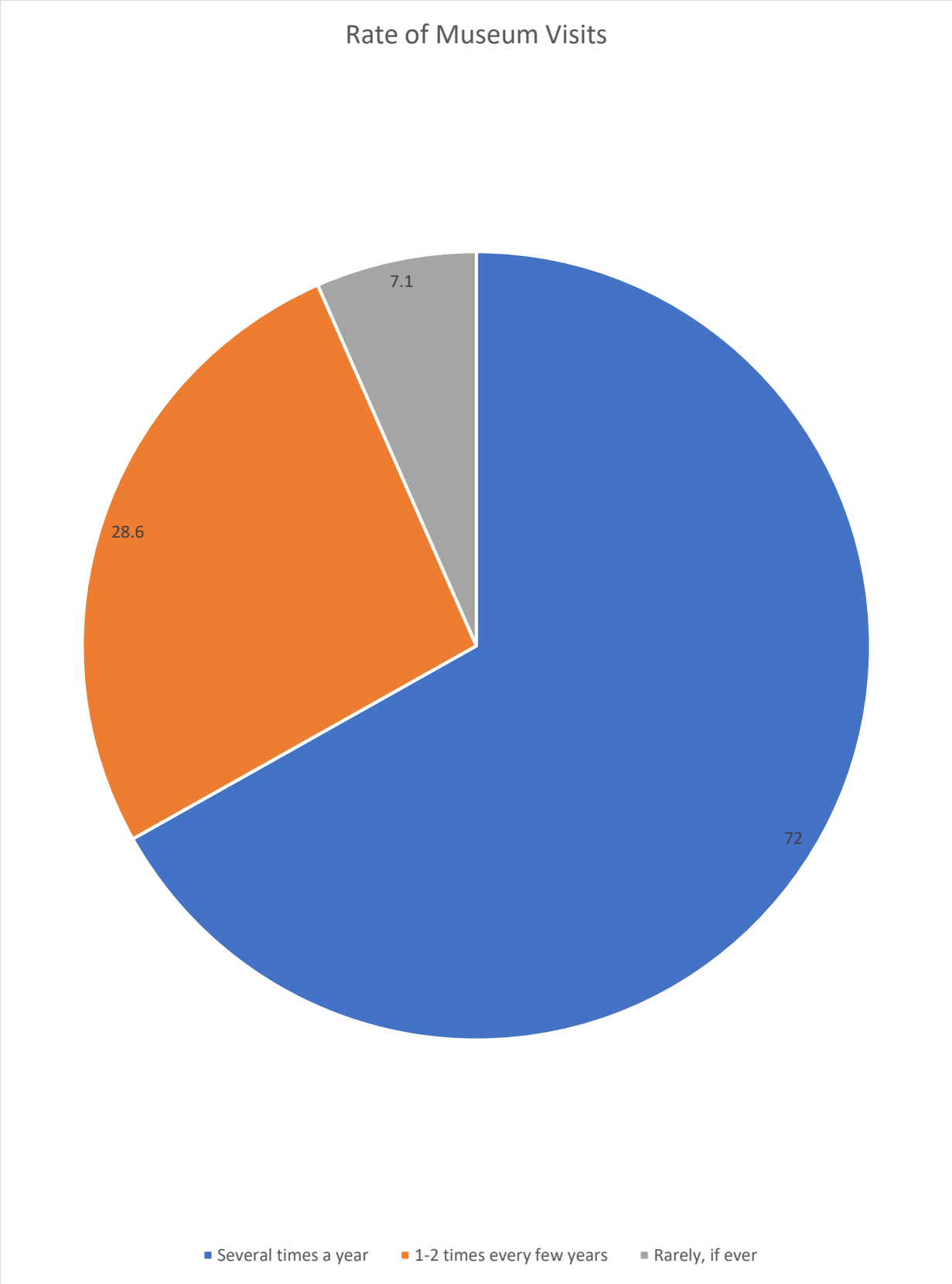

Figure 5.4: Rate of Museum Visits: Percentage of Total Surveys

When asked about familiarity with QR codes, 60.7% said they were familiar, while 39.3% said they were not. Only 46.4% of visitors used the QR codes in the museum with 53.6% not using the codes. However, of the visitors who did not use the QR codes, 35.7% said they would be open to using a QR code in a museum in the future (Table 5.3). Finally, all of the visitors surveyed said the format was understandable.

Familiar with QR Codes	**Percentage of Total**
Yes	60.7
No	39.3
Used a QR Code in the Museum	**Percentage of Total**
Yes	46.4
No	53.6
Would Use QR Code in Museum	**Percentage of Total**
Yes	35.7
No	7.1
Unknown	7.1
Blank	50

Table 5.3: Results to Questions 3-5 Second Survey

As with the first surveys, the QR code knowledge and use were broken down between the age ranges and rates of museum visit in order to determine if either of these factors affected visitors' knowledge or use. The results mirrored those of the first survey conducted at Brunswick Town, with knowledge and use decreasing slightly with age. Rate of museum visitation seemed to have a less obvious connection (Table 5.4). The following data is represented in percentage of the totals for each age range or rate of museum visits.

Age Range	Familiar with QR Codes		Used QR Code		Would Use QR in Museum			
18-30	Yes: 87.5	No: 12.5	Yes: 62.5	No: 37.5	Yes: 25	No: 12.5	Unknown: 0	Blank: 62.5
31-40	Yes: 75	No: 25	Yes: 50	No: 50	Yes: 50	No: 0	Unknown: 0	Blank: 50
41-50	Yes: 66.7	No: 33.3	Yes: 66.7	No: 33.3	Yes: 33.3	No: 0	Unknown: 0	Blank: 66.7
51-60	Yes: 66.7	No: 33.3	Yes: 50	No: 50	Yes: 50	No: 0	Unknown: 0	Blank: 50
61-70	Yes: 0	No: 100	Yes: 25	No: 75	Yes: 50	No: 0	Unknown: 0	Blank: 50
70+	Yes: 33.3	No: 66.7	Yes: 0	No: 100	Yes: 0	No: 33.3	Unknown: 66.7	Blank: 0
Rate of Museum Visits	**Familiar with QR Codes**		**Used QR Code**		**Would Use QR in Museum**			
Several times a year	Yes: 72.2	No: 27.8	Yes: 55.6	No: 44.4	Yes: 27.8	No: 11.1	Unknown: 0	Blank: 61.1
1-2 times every few years	Yes: 37.5	No: 62.5	Yes: 25	No: 75	Yes: 50	No: 0	Unknown: 25	Blank: 25
Rarely, if ever	Yes: 50	No: 50	Yes: 50	No: 50	Yes: 50	No: 0	Unknown: 0	Blank: 50

Table 5.4: Effect of Age Range and Rate of Museum Visits on QR Use and Knowledge

Interpretations

Will visitors to museums and museum-like places actually use QR codes? Based on the results of the first survey, the answer is yes according to over half of the visitors surveyed. Based on the results of the second survey, the answer is no according to over half of the visitors surveyed. This variation in supposed use verses actual use may be caused by a reduced sample size in the second survey or an unintended survey error caused by my presence during the first survey. In either case, a small majority of visitors surveyed at A Time for Science reported not using any of the QR codes present, though nearly half (46.4%) of visitors did use the QR codes. While this does show a small majority of visitors opting out of using the codes, this is a drastic

increase in use since 2013 when compared to the results of past studies by Pérez-Sanagustín et al. and Shultz. In her 2013 study, Shultz reported only 3.1% of the observed visitors used QR codes at the library where the study was conducted. Similarly, Pérez-Sanagustín et al. reported only 3% of the visitors to the Royal Botanical Gardens used the QR codes in 2016. More comparable to the results of this study, Pérez-Sanagustín et al. (2016) found that 52% of students surveyed at the engineering school in Chile used the QR codes available to them. Shultz and the survey conducted at the Royal Botanical Gardens reported little interaction with codes or reduced time interacting with QR codes as compared to stationary signage. The second study conducted by Pérez-Sanagustín et al. is an example of the increase in QR code use, comparable to the results of this study.

This study shows an increased familiarity with and use of QR codes in museum goers, and the two appear to be related. Shultz's study reported 66% of library users had past knowledge of the technology while out of the college library users interviewed by Ozkaya et al. 59% recognized the codes (Shultz 2013; Ozkaya et al. 2015). At Brunswick Town, 76.9% of visitors knew what a QR code was, and at A Time for Science that percentage is reduced to 60.7% which is more inline with the past studies. The visitors at A Time for Science reported familiarity with QR codes less frequently than did the visitors at Brunswick Town, and also had less visitors report use of the codes which suggests a relation between knowledge and use. In both cases fewer people who reported familiarity with QR codes said they would or had used a code. It can be shown through these results that familiarity with the technology does appear to be the factor which affects probable use the most, however familiarity alone will not lead to a visitor accessing information via QR code as not everyone who was familiar with the technology used it at A Time for Science. Also, at Brunswick Town over 60% of visitors surveyed reported no past

familiarity with QR codes, but that they would be interested in using a code in the future (Table 5.5). At A Time for Science, however, none of the visitors who had no past knowledge of QR codes used any of the codes (Table 5.6). These results suggest that as people become more familiar with QR codes and have the resources required to use them, the rate of use will also increase.

		Would Use QR Code			
		Yes	No	Maybe	Unknown
Familiar with QR Codes	Yes	88.75	1.25	1.25	8.75
	No	62.5	16.7	0	20.8

Table 5.5: Survey 1 Familiarity with QR Codes vs. Assumed Future Use

		Did Use QR Code(s)	
		Yes	No
Familiar with QR Codes	Yes	64.7	35.3
	No	0	100

Table 5.6: Survey 2 Familiarity with QR Codes vs. Use

Based on the results of both surveys, there does not appear to be a large correlation between age range and QR code use until the 61-70 and 71+ age groups. This shows that young people who grew up with modern mobile technology, and middle-aged people who experienced the development of modern mobile devices are more likely to use technology reliant upon these mobile devices. There is no immediate trend noticeable between rates of museum visits and QR code use. Age and past familiarity appear to be the most likely determining factors in visitor use of QR codes, and age and familiarity also seem to be connected. Visitors surveyed who were

older than 61 reported less familiarity and use of QR codes than those who were between 18 and 60.

CHAPTER 6: CONCLUSIONS

Public outreach and education are vital for the survival of archaeology. If archaeologists do not make their work accessible to the general public, then citizens will be less likely to consider supporting archaeological resources when voting or in their charitable giving. Museums, historic sites, and museum-like spaces offer excellent platforms for archaeologists to create educational materials on their work, especially if their work takes place at those locations. Technological and cultural changes have caused museums to change their techniques in displaying collections, creating educational materials, and communicating with their visitors. However, many of the newer technologies museums are designing and using, such as hand held tour devices, are expensive to implement and maintain causing museums with smaller budgets to lag behind those with larger budgets. Less expensive technologies exist in the form of quick response codes, which allow museum directors to introduce a new interactive experience and change exhibits as frequently as they can print new codes. By observing visitors to Brunswick Town/Fort Anderson State Historic Site and A Time for Science Greenville, North Carolina, this thesis was able to determine that QR codes represent a viable educational tool for museums, historic sites, and museum-like spaces which want to introduce technology into their displays or are working with a limited budget.

Significance

Quick response codes are becoming more common in public spaces. As this technology is utilized by companies and institutions, it is important to determine the consumer's attitudes towards it. Past studies have been conducted on how visitors to libraries and museum-like spaces interact with QR codes, but these studies were limited by focusing on college students, were conducted in facilities outside of the United States, or took place up to six years ago. This study is more applicable to museums in the United States, is not limited by focusing on one age group, and provides an updated look at how attitudes towards QR code technology has changed in the last six years. Technology, and the culture surrounding technology, is changing constantly and quickly, and in order to keep up with these ever-shifting trends new studies are required.

In addition to the QR code research, this thesis also provided a new educational tool to be used at Brunswick Town. The site lacked information on recent excavations, and the videos produced during this project were able to fill that gap. These videos provide an expert's description of the recent excavations, interpretations of a newly uncovered structure, and a behind-the-scenes look at an excavation for the visitors who were not fortunate enough to come to Brunswick Town while the excavation was taking place.

Future Research

Due to complications caused by Hurricane Florence, the original research design had to be adjusted to conduct surveys at a different location than planned. After the QR codes are installed at Brunswick Town, surveys should be conducted there as the surveys conducted at A

Time for Science revealed different demographics of visitors between the two locations. A larger sample size may also reveal different results in QR code use trends. Future studies should also explore interviewing visitors under the age of 18 to determine any difference in behaviors of younger visitors as compared to those over 18. These future surveys at Brunswick Town should be conducted in conjunction with an event as the first survey was. This tactic produced a larger sample size in the pre-implementation surveys and should be equally effective for the post implementation survey. Other museums who utilize QR codes in their exhibits should also be encouraged to study the rate with which visitors use their codes to create a larger body of work for future researchers and museum workers interested in utilizing this technology.

This study has also resulted in more questions for future research to explore. Being that visitors aged 51-60 are the most common age group at Brunswick Town, and 45-54 are the most common nation-wide, future studies may look into why this is. Could it be that these visitors are retired and looking to explore in their newly acquired free time? Another demographic question which was not asked in this study was what level of education visitors possessed. Future studies may consider comparing education level to familiarity and use of QR codes in an attempt to further understand who uses the codes and what efforts can be made to encourage their use to visitors unlikely to use them. In addition to this, other questions can be asked in future studies to determine why visitors do or do not choose to use QR codes. The reasons for someone not using the codes could include not having the proper application, not having a smartphone, not being interested, not being familiar with the technology, or something not thought of. Future surveys can be used to better understand the difference between visitors reporting interest in QR codes and those actually using them in order to develop methods of increasing their use.

Several strategies can already be identified as being potentially useful in increasing QR code use at museums which utilize this technology. If knowledge of the technology and the presence of QR codes affects visitor use, as determined in this thesis, then museums can increase this use by informing their visitors on the technology. This can be accomplished in several different ways. In order to communicate to visitors before they even arrive at the site, museum staff can post announcements on their websites and social media advertising their QR codes and the capabilities of this technology. Visitors can be informed of how these codes are used and encouraged to ensure their mobile devices are capable of scanning QR codes before they make their visit. On site, museums can also have their staff and volunteers inform visitors of the QR technology, encourage their use, and assist with any potential application download or use issues. An even simpler method of on-site informing would be to have a sign or flyer at the front desk informing visitors of the technology and how to use it. These instructions should, of course, be repeated on the signage containing the codes as well.

If QR code usage at Brunswick Town proves successful, there is great potential for expansion. More videos could be created and implemented into Brunswick's outside signage and inside museum. Other North Carolina state historic sites may also follow suite if the technology is enjoyed by the visitors. This could result in a collection of QR code accessible videos, text, images, audio files, and potentially even games to be shared throughout the state's historic sites. The more museums involved, the more potential content could be created and share. This technology can extend beyond archaeological methods as well. For example, QR codes could be used to show reenactments or digital reconstructions of sites. The inexpensive nature of quick response codes makes them simple to both create and replace and a huge benefit to museums

interested in rapid exhibit changes. The future possible uses of QR codes in museums are limited only by the imagination.

Closing Statement

Based on the pre-implementation survey results, visitors are widely accepting of the idea of QR codes, but fewer visitors will naturally use a code without prompting from museum personnel. This could be caused by lack of visibility of the signage or lack of previous knowledge. A visitor to a museum may overlook signage that blends into the background. At the A Time for Science location, the signage was tan against a white wall which may have caused a blending affect. This design flaw did not become apparent until the signage was observed in the location. Visitors may also not be used to using this type of technology at a museum, and therefore may not be looking for QR codes to use or may not know how to use them. Of the 104 people surveyed at Brunswick Town, 76.9% reported they were familiar with QR codes, but only 54.8% had actually used one in the past. This information shows that while the majority of visitors may be able to recognize what a QR code is, barely half of them would know what to do with it. A similar pattern can be identified in the data from A Time for Science, where 60.7% of visitors reported they were familiar with QR codes, but less than half actually used the codes in the museum.

Museums, visitor's expectations of museums, and the technology available have been developing alongside and adapting to each other. Compared to previous studies conducted on the use rate of QR codes in museums and museum-like settings, my results show an increased rate of use from 3.1% in 2013 and 2016 to 46.43% in 2018, which is comparable to Pérez-Sanagustín et

al.'s study which showed 52% of people surveyed used their codes (Shultz 2013; Pérez-Sanagustín et al. 2016). It is my belief that QR code use will continue to increase over time until some new technology makes them obsolete, as is the trend with most technology in museums. Unlike more expensive options, such as static video screens, audio guides, and virtual reality capable computers, QR codes will not be a technology which becomes obsolete at great cost to facilities which utilize them. There is inherent cost in the filming process, if a facility uses QR codes as links to videos, and there is also the printing and posting costs to consider. However, there are several websites which will generate QR codes completely free and any media that museums already have can be converted into QR format. Quick response technology offers an option to museums which allows visitors the ability to actively interact with the displays, is easy to change up displays, and comes at little financial risk.

Everything at a museum or museum-like setting is optional. You have the option of reading every sign and interacting with every exhibit, or you have the option of walking through and looking at the pretty collections. QR codes offer another educational tool which visitors can choose to utilize or not. Different people enjoy different experiences, and different people enjoy learning in different ways. It is important for museums to ensure they are providing their visitors with options to experience and learn in ways which are most effective for them. Quick response codes provide museum visitors with another interactive way to get more information on the location or collections they are visiting, and the videos created through this project provide visitors the ability to experience archaeology in a new way at Brunswick Town/Fort Anderson State Historic Site and A Time for Science.

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APPENDIX A: PRE-INSTALATION SURVEY

1. What is your age range?

   18-30
   31-40
   41-50
   51-60
   61-70
   71+

2. How many people are in your group?

   Adults (18 and Older) _____ Children (Under 18) _____

3. How often do you visit museums (history museums, art museums, zoos, historic sites)?

   Several times in a year.
   1-2 times every few years.
   Rarely, if ever.

4. Are you familiar with what a Quick Response (QR) code is? (One of these )

   Yes
   No

5. Have you ever used a Quick Response (QR) code?

   Yes
   No

6. Would you be open to using a Quick Response (QR) code to access additional information at a museum exhibit?

   Yes
   No
   Unknown

APPENDIX B: POST-INSTALATION SURVEY

1. What is your age range?

   18-30
   31-40
   41-50
   51-60
   61-70
   70+

2. How many people are in your group?

   Adults (18 and Older) _____ Children (Under 18) _____

3. How often do you visit museums (history museums, art museums, zoos, historic sites)?

   Several times in a year.
   1-2 times every few years.
   Rarely, if ever.

4. Are you familiar with what a Quick Response (QR) code is? (One of these )

   Yes
   No

5. Did you use any of the Quick Response (QR) codes available along the walking path through the site?

   Yes
   No

6. If you did not use any of the Quick Response (QR) codes, would you be open to using a QR code at a museum in the future?

   Yes
   No
   Unknown

7. Was the format understandable and easy to access?

   Yes
   No

APPENDIX C: IRB LETTER OF APPROVAL

EAST CAROLINA UNIVERSITY
University & Medical Center Institutional Review Board
4N-64 Brody Medical Sciences Building· Mail Stop 682
600 Moye Boulevard · Greenville, NC 27834
Office **252-744-2914** · Fax **252-744-2284** ·
www.ecu.edu/ORIC/irb

Notification of Exempt Certification

From: Social/Behavioral IRB
To: Kimberly Byrnes
CC: Cynthia Grace-McCaskey
Date: 5/21/2018
Re: UMCIRB 18-001072
QR Code Use

I am pleased to inform you that your research submission has been certified as exempt on 5/19/2018. This study is eligible for Exempt Certification under category #2.

It is your responsibility to ensure that this research is conducted in the manner reported in your application and/or protocol, as well as being consistent with the ethical principles of the Belmont Report and your profession.

This research study does not require any additional interaction with the UMCIRB unless there are proposed changes to this study. Any change, prior to implementing that change, must be submitted to the UMCIRB for review and approval. The UMCIRB will determine if the change impacts the eligibility of the research for exempt status. If more substantive review is required, you will be notified within five business days.

The Chairperson (or designee) does not have a potential for conflict of interest on this study.

IRB00000705 East Carolina U IRB #1 (Biomedical) IORG0000418
IRB00003781 East Carolina U IRB #2 (Behavioral/SS) IORG0000418